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W. J. Gage & Co.'s Examination Primer Series.

PROBLEMS IN ARITHMETIC

FOR

FOURTH BOOK CLASSES.

BY

W. E. GROVES,

Principal Church Street School, Toronto.

Teachers Edition, with Answers.

W. J. GAGE & COMPANY,
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PREFACE.

In offering this volume to the school public the author shall tender no apology. He is actuated by a desire to furnish assistance to his fellow teachers who have probably not had the time to collect a similar set of exercises. He would, however, ask for a careful perusal of the Exercise on the "Metric System." The explanation is necessarily brief, but the hope is entertained that it will be found sufficient. Special attention has been given to the practical business exercises of "Notes and Discount," "Partial Payments," and "Interest." A last feature is the examination papers containing Entrance Papers for the past ten years, Third Class and Primary for the past seven years, and Combined Examination Papers of the Toronto Public Schools for the past three years.

W. E. GROVES.

Church Street School,
Toronto, August, 1892.

PROBLEMS IN ARITHMETIC

FOR FOURTH BOOK CLASSES.

I.—Review Problems.

(1) A drover bought a certain number of cattle for $2,025. He then sold 17 of them for $918, gaining on what he sold $153. How many did he buy, and what did each cost him?

(2) A farmer had 300 bushels of wheat, and sold 25 bush. 3 pk. 1 gal. to one man, and twice as much to another. How much had he left? Answer in bushels, etc.

(3) The road between two villages is 4 rods wide and contains 32 acres. How far are the villages apart?

(4) I bought butter which I sold at 21c. per lb., and I gained only 48c. on the whole; if I had sold it for 15c. per lb., I would have lost 108c. on the whole. How many pounds did I buy and what did I pay for it per lb.

(5) Make a bill of the following articles, and after carefully finding the amount, receipt it: 16 lb. butter @ 19c. per lb.; 378 lb. hay @ $10 per ton; 56 lb. barley @ 48c. per bushel, and 139 eggs @ 12c. per dozen.

(6) A man sold 3 sheep for $34. For the first he received $4 less than for the second, but $3 more than for the third. What did he get for each?

(7) A woman sold 8 turkeys and 8 geese for $11.60, getting 25c. a piece more for each turkey than for a goose. What price did she get for each?

(8) Find the aggregate and also the average price of 12 geese at \$1.66 per pair, 15 turkeys at \$1.05 each, 17 chickens at 17c. each, and 12 ducks at 60c. per pair.

(9) How many barrels of flour at \$7 per barrel should be given for a pile of wood 72 ft. long, 12 ft. wide and 8 ft. high, at \$3.50 per cord?

(10) If 1 ton of coal takes up 40 cubic ft. of space, how many tons can be put into a bin 6 ft. × 8 ft. × 5 ft.?

(11) A farm 360 rods long and 180 rods wide was divided into 7 equal lots. What was the size of each lot in acres, rods, yards, feet and inches?

(12) A man walked 23 mi. 150 rods 5 yd. on Monday; on Tuesday 18 mi. 231 rods 3 yd., and on Wednesday he rode on the cars 4 times the distance he had walked. What was the average distance travelled on each of the three days?

(13) From Belleville to Madoc is 26 mi. 80 rods, and a carriage wheel turns 11,088 times in going the distance. Find the circumference of the wheel in feet and inches.

(14) Divide \$18 among John, James and Henry, so that John gets \$1.20 more than James, and James \$3.60 more than Henry.

(15) A man having \$700, bought a load of hay weighing 1,640 lb. at \$8 per ton, 1,460 ft. of boards at \$14.50 per M., and 1,904 lb. of oats at 30c. per bush. How many acres of land at \$4 per acre could he buy with the money he had left?

(16) A drover bought 28 sheep at \$3.65 each, and 35 others at \$4.12 each. At what average price must he sell each of them to gain \$28.91 on the whole number?

(17) A field is 40 rods wide and contains 12 ac. What will it cost to fence it at 3½c. per yd.?

(18) How many bricks 8 in. × 2 in., placed on edge will be required to pave a rectangular yard 40 ft. × 25 ft.?

(19) Find the cost of plastering the walls and ceiling of a room 16 ft. long, 14 ft. 3 in. wide, and 10 ft. high, two doors 7 ft. × 3 ft. 10 in., two windows 6 ft. × 4 ft., skirting-board 1 ft. high, at 22c. per square yd.

(20) Make a bill of the following entries:—James Anderson bought of Geo. Ritchie & Co., Jan. 13, 1892, 14½ yd. of dress goods @ 65c. per yd., 3¾ yd. of linen @ 36c. per yd., 4½ yd. of lining @ 15c. per yd.; Jan. 17, 18 pearl buttons @ 24c. per doz., 3 spools of thread @ 5c. each; Jan. 26, 8¼ yd. of tweed @ 72c. per yd., 16 yd. of cotton @ 12½c. per yd., 15 yd. of cloth @ 45c. per yd.

(21) A man agrees to sell $37\frac{11}{12}$ cords of wood. He delivered $18\frac{2}{3}$ cords one week, and $16\frac{3}{4}$ cords the next. How many cords had he still to deliver?

(22) Find the cost of the wire at 6c. per 5 yd. for a barbed-wire fence five wires high, to enclose a rectangular field 36 po. × 45 po.

(23) Make out a bill of the following sales, and show that a payment has been made on account, and that a balance remains due:—17 yd. of flannel @ 40c. per yd., 18 yd. of gingham @ 8c. per yd., 20 yd. of tweed @ 90c. per yd., 3 felt hats @ $2.70 each, 40 yd. of ribbon @ 9c. per yd., 90 yd. of cotton @ 12c. per yd. Received in payment 50 lb. of butter @ 16c. per lb., and 17 doz. eggs @ 15c. per doz.

(24) How many pounds of butter at 19c. per lb. will be required to pay for a cow costing $47.50?

(25) If a clock strikes the hour regularly, in how many days will it have struck 2,808 strokes?

(26) If a farmer got 280 bush. of wheat from 14 ac. and sold it at the rate of 90c. per bush., what was his return per acre, and what his profit on the whole crop, if his labor and trouble were of the value of $5.50 per ac.?

(27) A mistake to the amount of $8.56 less than the true amount was made in adding up an account. The amount as rendered showed the debt to be $100.54. What was the true debt?

(28) How many yards of carpet 27 in. wide will cover 30 square yards? If the carpet were a yard wide what difference would it make?

(29) How many cords of wood in a pile 64 ft. long, 8 ft. wide and 6 ft. high? Find its value at the rate of $2.40 per cord.

(30) How many cubic yards in a rectangular excavation for a cellar 24 ft. × 18 ft. × 5 ft.?

(31) How many boards, each 16 ft. long, will be required to build 2,572 ft. of fencing, 5 boards high, 12 ft. to be left for an entrance?

(32) The distance from Toronto to Montreal is said to be 330 miles by railroad. How long will it take a train to go from one place to the other at an average rate of speed of 30 miles an hour, excluding a delay of 90 minutes by reason of accident, and also including such delay.

(33) How many acres, square rods, and yards in a field 460 yd. long and 246 yd. wide?

(34) Find the total cost of the following:—2,648 lb. of barley @ 60c. per bush., 1,820 lb. of rye @ 48c. per bush., 1,946 ft. of board @ $14 per 1,000 ft., 860 lb. of coal @ $6.40 per ton, a pile of wood 80 ft. long, 6 ft. high and 4 ft. wide @ $4.60 per cord.

(35) How many chains of 66 ft. each would make 4 mi. 160 rods?

(36) How many times must a bicyclist go around a course 106 rods 1 yd. long to complete 4 mi. 312 rods 4 yd.?

(37) The road from Belleville to Tweed is 26 mi. long, and 4 rods wide. How many acres in the road?

(38) A farmer sold a merchant 2 loads of hay, weighing repectively 1,846 and 1,946 lb., @ $14.50 per ton, and 846 lb. of pork @ $6 per 100. He received in payment 36 yd. of sheeting @ 7c. per yd., 6 yds. of cloth @ $4.48, and for the balance, sugar @ 6c. per lb. How much sugar did he receive?

(39) Find the total value of the following: $4\frac{3}{4}$ lb. @ 24c., $6\frac{7}{8}$ lb. @ 32c., $12\frac{5}{6}$ lb. @ 36c., and $24\frac{2}{3}$ lb. @ 18c.

(40) Take a million inches from 100 miles. Answer must be in miles, rods, yards, feet and inches.

(41) A horse and cutter are worth $576, the horse being worth $146.88 more than the cutter. How much is each worth?

(42) A man bought at different times 4 lots containing respectively $\frac{3}{4}$ of an acre, $\frac{2}{3}$ of an acre, $\frac{5}{8}$ of an acre, $\frac{5}{6}$ of an acre. How much land did he buy?

(43) Find the L. C. M. of 24, 36, 27, 45 and 72.

(44) (*a*) Divide $3.29 as nearly equally as possible among 18 persons.
(*b*) How often is 18c. contained in $3.29.
(*c*) Write the result of each division in a complete statement.
(*d*) Work part (*a*) by subtraction. If you think it can't be done by subtraction give reason.
(*e*) Do part (*b*) by subtraction. If you think it cannot done that way tell the reason.

(45) If 4 slates cost 44c., then 228 slates will cost 57 multiplied by 44c. = $25.08. Show why the above statement is wrong.

(46) When 4 ft. 3 in. of heavy brass-wire cost 22c. more than 3 ft. 4 in., what is the price per yard.

(47) *C* offers his load of wood, measuring 120 cubic feet, for $4.75. *B* offers his at the rate of $5 per cord. Which load is dearer?

(48) The Township of W. Missouri is 13 mi. 160 rods long and 6 mi. wide. What is the land in that township worth at $42.50 per acre?

(49) (*a*) How long, how wide and how thick is a square foot?
(*b*) How long, how wide and how thick is a cubic foot?
(*c*) How long, how wide and how thick is a board foot?

(50) A closed tin box 6 in. long, 4 in. wide and 3 in. deep, is filled with ochre. How many square inches of tin were required to make the box? How many cubic inches of ochre in the box?

(51) A farmer sold 3 loads of wheat: 2,430 lb. @ 92c. per bush., 2,190 lb. @ 90c. per bush., and 2,220 lb. @ 95c. per bush. What was the average price per bushel that he received?

(52) (*a*) $1.92 per lb. is how much per ounce?
(*b*) 2½c. per quart is how much per peck?
(*c*) $44.50 per month is how much per year?

(53) Make a bill of the following:—Mrs. Clark bought of Messrs. Brown & McKay, Oct. 4, 1890, 5 lb. 8 oz. of currants @ 10c. per lb., 25 lb. of rice @ $5 per cwt. and 6 bars of soap @ 3 for 25c.; Oct. 11, 19 yd. of cotton @ 8c. per yd. and 14 yd. of dress goods @ 27c. per yd.; Oct. 18, 3 qt. of syrup @ 80c. per gal. and 13 lb. 8 oz. of sugar @ 9 lb. for a dollar, and paid $5 on account.

(54) A certain field contained 47 ac. 18 sq. rods 11 sq. yd. 6 sq. ft. From it a field 24 rods long and 125 yd. 2 ft. wide was cut off. How much of the field still remained?

(55) How many cords in a pile of wood 40 ft. long, 6 ft. high and 4 ft. wide?

(56) How many acres in the form of a square can be enclosed by 240 rods of fence?

(57) A man has the contract to fence the railroad on both sides from Mitchell to Stratford, a distance of 12 mi. 180 rods 2 yd. 2 ft. Working 10 hours a day how long would it take him to complete the work if he put up 7 rods 1 yd. 2 ft. an hour?

(58) What would 2 tons 8 cwt. 20 lb. of wheat cost at $1.20 per bushel?

(59) How acres in 4,067,368 sq. in.?

(60) A herd of 38 cattle weigh altogether 27 tons 11 cwt. What is their average weight?

(61) Find the cost of digging a cellar 24 ft. long, 18 ft. wide and 6 ft. deep at 80c. per cubic yard.

(62) Find the total cost of the following. and then the average price per pound :—$24\frac{3}{4}$ lb. @ 48c. per lb., $19\frac{5}{6}$ lb. @ 24c. per lb., $24\frac{7}{8}$ lb. @ 32c. per lb., $13\frac{2}{3}$ lb. @ 12c. per lb.

(63) How many barrels of water are there in a rectangular cistern 8 ft. × 7 ft. × 6 ft.?

(64) A farm 90 rods long and 80 rods wide is to be divided into 7 fields of equal size. How many acres, rods, yards, feet, and inches in each field?

(65) A drover bought 29 sheep at $4.89 each, and 99 others at $5.45 each. At what price each must he sell to gain $304.16 on the whole number?

(66) A man having $150, bought a load of hay, weighing 1,830 lb. @ $7 per ton, 3,846 lb. of oats @ 40c. per bush., and enough of 3-inch plank to build 20 rods of sidewalk 6 ft. 6 in. wide, @ $14 per M. How much money would he have left?

(67) A field is 40 rods long and contains 8 ac. What will it cost to fence it at $4\frac{5}{6}$c. per yd.?

(68) Resolve 1,890 into its prime factors, and find the L.C.M. of 4, 6, 8, 12, 20, 24, 36, 48, 72.

(69) How many feet, board measure, are there in 720 boards, 14 ft. long, 8 in. wide, and 1 in. thick; 40 planks, 16 ft. long, 10 in. wide, and 3 in. thick; and what will the whole cost at $12 per 1,000 ft.?

(70) Take 78,947 ft. from 20 mi. Answer must be in miles, rods, yards, feet, and inches.

(71) What will it cost, at 25c. per sq. yd., to gravel a walk 3 ft. wide, around a grass plot 24 ft. square?

(72) How many times will a wagon wheel 4 yd. 2 ft. in circumference, turn in a distance of 1 mi. 16 rods?

(73) A pile of wood containing 10 cords is 64 ft. long and 4 ft. wide. How high is it?

(74) If three stoves consume 10 ton 7 cwt. 50 lb. of coal in 6 months, how much would be required for two stoves for 2 months?

(75) Multiply 63 ac. 105 sq. rods 20 sq. yd. 2 sq. ft. 80 sq. in. by 160.

(76) If 86 horses eat 40 bu. 1 pk. 2 qt. of oats in a day, how much would 1 horse eat in a week?

(77) What is a square, a cube, a rectangle?

(78) How many feet, board measure, are there in 80 planks, 18 ft. long, 10 in. wide, and 2 in. thick?

(79) How much lumber will be required to make a covered box, 12 ft. long, 4 ft. high, and 3 ft. wide?

(80) Find the cost of digging a celler 30 ft. long, 18 ft. wide, and 6 ft. deep, at 20c. per cubic yd.

(81) I mixed 4 bush. of peas @ 54c. per bush., 12 bush. of oats @ 26c., and 8 bush. of barley @ 39c. What was the mixture worth a bush.?

(82) Find the total cost of the following, and then the average price per pound:—$29\frac{7}{8}$ lb. @ 48c. per lb., $49\frac{1}{6}$ lb. @ 36c. per lb., $23\frac{2}{3}$ lb. @ 24c. per lb.

(83) How many square inches are there in the outside surface of a crayon box 8 in. × 6 in. × 4 in.?

(84) How many barrels of water will a rectangular cistern hold, whose dimensions are 10 ft. × 8 ft. × 6 ft. 6 in.?

(85) What will be the total cost of the following at $16 per M.?—840 boards, 13 ft. long, 10 in. wide, and 1 in. thick; 60 planks, 13 ft. long, 8 in. wide, and 3 in. thick; 24 scantlings, 13 ft. long, 4 in. wide, and 2 in. thick.

(86) A rectangular room is 36 ft. × 14 ft. 6 in. × 10 ft. 10 in., the skirting board is 10 in. high; there are 2 doors, 7 ft. 4 in. × 4 ft. each, and 4 windows, 6 ft. 6 in. × 4 ft. each. Find the cost of plastering the walls and ceiling at 22c. per sq. yd.

(87) Find the G.C.M. of 374 and 2,295, and the H.C.M. of 2, 4, 6, 8, 10, 12, 24, 48, 64.

(88) A farm 40 chains wide and 200 chains long is to be divided into 7 fields of equal size. How many acres, rods, yards, feet, and inches in each field?

(89) How many posts 7 ft. apart will be required for a fence around a field, whose length is 80 rods 10 ft., and width 60 rods 4 ft.?

(90) A lot 99 ft. deep is sold at the rate of $35 per ft. of frontage; what rate is that per ac.?

(91) Find the total cost of the following:—6,480 lb. of wheat @ 90c. per bush., 2,832 lb. of barley @ 56c. per bush., 1,845 lb. of hay @ $8 per ton, a pile of wood, 32 ft. × 7 ft. × 4 ft., @ $4.75 per cord.

(92) Without reducing to lowest denomination, find the difference between 7 mi. 7 fur. 3 yd. 1 ft., and 5 mi. 7 fur. 35 rods 4 yd. 1 ft. 6 in.

(93) What number must be added to 280 so that 133 times the sum will be 95 times 399?

(94) *A* starts at 9 o'clock in the forenoon to walk from Kingston to Brockville at the rate of 4 mi. an hour. Two hours earlier *B* had started to walk from Brockville to Kingston at the rate of 3 mi. an hour. If the distance be 48 mi., where and when will they meet?

(95) Make out a bill of the following goods bought from Wm. Cosgrove, Napanee, by John Graham, Picton:—15½ yd. of broadcloth @ \$1.50, 26 lb. of nails @ 3½c., 18 doz. eggs @ 17c. 3 pairs of shoes @ \$1.37, 36 lb. of sugar @ 9½c.

(96) Find the value of 3,250 lb. of hay @ \$8.50 per ton, and 4,965 lb. of oats @ 51c. per bush. of 34 lb.

(97) If the distance from Cornwall to Morrisburg be 27 mi., and a man takes 120 steps, 2½ ft. long, in 1 minute, how far will he be from his journey's end after he has walked 8 hr. 50 min.?

(98) How long will it take 12 men to do a piece of work that 8 men can do in 27 days?

(99) The price of butter per lb. is double that of eggs per doz. If \$3.90 buy 42 doz. eggs, and 12c. over, find the price per lb. of the butter.

(100) If a railway train travels 45 mi. in an hour, how many yards will it go in one second?

(101) If 6 bush. of wheat are worth \$5.10, what is the value of a load containing 3,120 lb.?

(102) Find the cost of digging a cellar, 30 ft. long, 24 ft. wide, and 8 ft. deep, at 42c. per cubic yd.

(103) A building 24 ft. long, and 18 ft. high, is filled with wood to a height of 10 ft. Find its value at \$3.20 per cord.

(104) A man can dig 25 bush. of potatoes in a day, and pick 75 bush. in the same time. How many bush. can he dig and pick in 2 weeks?

(105) A man has enough oats to last 27 horses for 132 days, but he sold some of the horses, and the oats lasted the remainder 162 days. How many did he sell?

(106) What will it cost to plaster a room, 14 ft. long, 12 ft. wide, and 10 ft. high, with 2 coats at 12c. per sq. yd. for each coat, allowing 120 sq. ft. for doors and windows?

(107) The sum of \$165 is to be divided among a man, his wife, and child, so that the man shall receive \$1.25 as often as his wife gets 85c., and his child gets 40c. What is the share of each?

(108) A merchant mixed 28 gal. of vinegar, at 50c. per gal., and 22 gal. at 40c. per gal., with such a quantity of water that the mixture is now worth only 36c. per gal. How much water was added?

(109) A train runs at the rate of 25 mi. per hour for 12 hr. How many days will a man require to walk the same distance at 3 mi. per hour, and walking 8 hr. per day?

(110) The cost of gravelling 3 yd. of road is $1.25. At that rate, what would be the cost of gravelling 10 mi.?

(111) What is the difference between abstract and concrete numbers; between prime and composite? Give examples. Find the prime factors of 18,948.

(112) A boy lost $\frac{5}{12}$ of his money; after getting 63c. he found that he had $\frac{7}{9}$ of what he had at first. How much did he lose?

(113) The quotient is 19 times the remainder; the divisor is equal to the sum of the quotient and remainder; the quotient is 15,637. Find the dividend.

(114) Make out the following bill in proper form:—5½ yd. of cotton @ 12½c. per yd., 6¾ lb. of butter @ 16c. per lb., 12¼ lb. of sugar @ 10½c. per lb., 2 lb. of tea @ 60c. per lb., and 2 gal. 3 qt. of coal oil @ $1.20 per gal.

(115) A cellar is 30 ft. × 24 ft. At the rate of 12½c. per cubic yd., it cost $30 to dig it. Find its depth.

(116) A gentleman left by will $2,250 among *A*, *B*, and *C*. *B* was to have $90 less than *A*, and *C* $90 more than *A*. After his death it was found that his effects were worth only $2,000, and $200 had to be deducted from this amount before distribution. What was the share of each?

(117) What is a fraction? Write $\frac{5}{21}$ in words. Why is 5 called the numerator and 21 the denominator? In what two ways can $\frac{5}{8}$ be divided by 5? What would be the result if the numerator and denominator were both multiplied by 5? Reduce $\frac{3}{5}$ and $\frac{2}{3}$ to equivalent fractions with 45 for denominatar. Divide the less by the greater, and reduce to lowest terms.

(118) Find in minutes the value of $6\frac{7}{10}$ dy. − $\frac{9}{14}$ wk. − $\frac{11}{15}$ min. + $\frac{3}{5}$ hr.

(119) Reduce 1 rd. 12 rods 16 yd. 580 ft. to the fraction of 2 ac.

(120) A hall is 45 ft. long and 11¼ ft. wide; what will it cost to carpet it with carpet, 27 in. wide, at $1.75 per yd.?

(121) How many cords are there in a pile of cordwood 128 ft. long by 12 ft. high?

(122) 42 hr. 56 min. 24 sec. ÷ 9

(123) A sulky wheel, 14 ft. 8 in. in circumference, made 7,200 revolutions in 2 hr. What distance did the sulky go during 1 hr.?

(124) How many inches is it by railway from Harriston to Toronto, a distance of 95 mi.?

(125) How much will it cost to gravel a road 80 rods long with a layer 9 ft. wide and 6 in. deep at 30c. per load?

N.B.—A cubic yard of earth is called a *load.*

(126) Green tea and black tea are mixed as follows: for every 3 oz. of green there are 7 oz. of black. How much of each in 5 lb. of the mixture?

(127) The mean height of 5 trees is 91 ft. What must be the height of a sixth tree which brings the average up to 94 ft.?

(128) Find the cost of wire, at 8c. per 5 yd. for a barbed wire fence, 5 wires high, to enclose a field 36 rods wide and 45 rods long?

(129) How many half-pint bottles will be required to hold 8 gal. 3 qt. of ink?

(130) The sum of $135 was paid as a week's wages to an equal number of men, women and boys. The men received $1.25, the women 75c. and the boys 50c. per day. How many were there of each class?

(131) How many feet of lumber will be required to plank a play ground 166 ft. long, 66 ft. wide, with plank 2 in. thick?

(132) How much heavier are 9 barrels of flour than *one* cubic yard of water?

N.B.—A cubic foot of water weighs 1,000 ounces.

(133) A boy dividing a number by factors used 7 for the first divisor and 8 for the second; his first remainder was 1, the second remainder was 5 groups of the size of the first divisor; his quotient was 7,115. Find the divisor, dividend and remainder.

(134) When 3,468 bush. of wheat are worth $3,121.20 how much is it worth per cwt.?

(135) Two trains 171 mi. apart approach each other, one at the rate of a mile in 3 min., the other at the rate of 37 mi. an hour: how long before they pass each other?

(136) (*a*) How many pounds of butter at 2c. per oz. would pay for 276 lb. of sugar at 2 oz. for 1c.

(*b*) How many eggs at 17c. per doz. would pay for 1,200 oz. tea at 51c. per lb.?

(137) An oblong 5-ac. field is 20 rods across the end; find the cost of fencing it all round at 35c. per rod.

(138) A pint of a certain oil weighs 1 lb. How many 4 oz. vials can be filled out of 2 gal. of it?

(131) *A* works from 1st of March until last day of September at $22 per month. *B* works at $14 per month from 1st of February until last of December. How long must *C* work at $16 per month to earn as much as both the others?

(140) *A* had 12 boards, each 12 ft. long, to cut into 3 ft. lengths; by mistake he cut them in 4 ft. lengths. How many more 12 ft. boards must he buy to get the right number of pieces?

(141) Make a bill of the following items: Mrs. Galt bought of Armon Bros., Mar. 4, 1889, 8 lb. 8 oz. of currants @ 8c. per lb., 25 lbs. of rice @ $5 per cwt., 9 bars of soap @ 3 for 25c.; Mar. 19, 43 yd. of cotton @ 7c. per yd., 16 yd. of dress goods @ 29c. per yd., ½ doz. spools @ 3 for 10c.; Mar. 28, paid cash on account $5 and bought 3 qt. of maple syrup @ $1.20 per gal., and paid the balance in cash on April 4.

(142) What is a compound number? If you combine two compound numbers so as to form one compound number, what do you call the operation? Find a compound number equal to the following numbers taken together:—2 ac. 3 rods 25 yd.; 3 rd. 18 yd.; 4 ac. 27 rods 11 yd.

(143) Multiply 8 mi. 14 yd. 7 in. by 96, using factors.

(144) How many boards, 1 ft. wide, and 12 ft. long, will be required to enclose a lot 248 ft. long, and 196 ft. wide, with a tight board fence 4 ft. high?

(145) What will it cost to cover both sides of a wall, 48 ft. long, and 12 ft. high, with paper, at a cost of 45c. for each sq. yd. of surface?

(146) How many bags, of 90 lb. each, may be filled from a car-load of potatoes weighing 9 ton 437 lb., and how many lb. of potatoes will be left?

(147) How many silver spoons, each weighing 4 oz. 10 dwt. 15 gr., may be made from a piece of silver weighing 3 lb. 4 oz. 15 dwt. 15 gr.?

(148) Find the least number which, divided by 12, 18, 28, leaves in each case the remainder 7.

(149) How many hr. will it take to travel 105 mi. at the rate of 44 ft. in 1 sec., allowing 30 min. for stoppages on the road?

(150) How many eggs, at 16c. per doz., should be given in exchange for 32 oranges, at 45c. per doz.?

(151) Mrs. Jones sold 240 eggs @ 13c. per doz., 11 lb. of butter @ 18c. per lb., 3 bags of potatoes @ 60c. a bag, 16 chickens @ 36c. per pair, 7 gal. of maple syrup @ 30c. per qt., and then spent all the money she received for these articles except $1.98. How many dollars did she spend?

(152) A man can run 100 yd. in 20 sec. How many mi. will a train go in 6 dy. at the same rate?

(153) A lot, 300 ft. long, and 200 ft. wide, is to be surrounded with a tight board fence 6 ft. high. What will the boards cost at $9.50 per thousand ft.?

(154) How many acres are there in a road 4 rods wide, and a mile and a quarter long?

(155) A map is drawn to a scale of half an inch to a mile. How many acres are represented by 4 sq. in. on the map?

(156) How many piles of wood, 12 ft. long, 4 ft. wide, and 4 ft. high, can be made out of a pile 48 ft. long, 16 ft. wide, and 6 ft. high?

(157) Divide $108 among Tom, Dick, and Harry, in such a way that if Tom has $8, Dick shall have $9, and Harry $10.

(158) A seedsman bought 3,600 lb. of potatoes, at 60c. per bush., and sold them out at 12½c. per gal. How much did he make on the load?

(159) Make a bill of:—900 eggs @ 14c. per doz., 126 ducks @ 30c. per pair, 6,060 lb. of wheat @ 90c. per bush., 25 turkeys @ 85c. each, and 9 sheep @ $3.75 each.

(160) How much will it cost to plaster a room, 15 ft. square, and 9 ft. high, if the doors and windows take up 114 sq. ft., when it costs 21c. to plaster 1 sq. yd.?

(161) Find the cost of carpeting the room in the last question with carpet, 30 in. wide, at 87c. per yd., carpet to be laid lengthwise.

(162) Find the amount of the following bill:—10 yd. of cloth @ 75c. per yd., 17 lb. of sugar @ 9c. per lb., 150 lb. of flour @ $1.75 per 50 lb., 14 kegs of nails, 80 lb. each, at 3c. per lb.

(163) What is meant by a Measure? a Multiple? Find the G.C.M. of 1,866 and 1,492. L.C.M. of 5, 15, 25, 40, 48, 112.

(164) *A* bought 2 cwt. 17 lb. of beef, *B* bought 5 times as much, and *C* as much as *A* and *B* together. How much did all buy? If it all cost $130.20, what would *A*'s share cost?

(165) A train starts from London to Sarnia at 31 mi. per hr.; it takes 120 min. to finish the journey. What fare should a passenger pay at 3c. per mi.?

(166) A man sold 196 bush. of wheat @ $1.32 per bush., 41 steers @ $72.50 each, 284 sheep @ $9.20 each. With the money he bought 476 ac. of land; find in dollars and cents the price per ac.

(167) How many cords of wood in a pile, 348 ft. long, and 6 ft. high; the wood 4 ft. long?

(168) A man bought 120 ac. of land for $7,200. He sold $\frac{1}{4}$ of it at $87 per ac., $\frac{1}{3}$ of it at $96 per ac., and the rest at $64 per ac. How much did he gain?

(169) If a wire fence is worth 30c. per ft., what will 3 rods cost?

(170) If 4 lb. maple sugar is sold for 60c., how many pounds can be sold for $1?

(171) A produce merchant bought 10 barrels of flour at $4.75 per barrel, and sold it in quarter-barrel lots at $2.75 each; how much did he gain?

(172) Which is the more economical to buy, a coat for $14 which will last 8 month, or one at $19 which will last a year?

(173) A father earns $6 while his son earns $2.75; when they have earned $105 how much will belong to each?

(174) *A* sods $\frac{1}{2}$ of a lawn, *B* $\frac{1}{3}$ of the remainder, then *C* finishes it. How much does *C* do?

(175) A man earns $\$1\frac{3}{4}$ a day; in what time will he earn $\$15\frac{3}{4}$?

(176) If the divisor be $\$\frac{9}{16}$ and the quotient $\frac{20}{21}$, what will be the dividend?

(177) How many square yards of oilcloth $1\frac{1}{2}$ yd. wide will be required for a hall floor $5\frac{1}{4}$ yd. long and 9 ft. wide?

(178) If a plank be 16 in. wide, what length of it will lay a surface of 2 sq. yd.?

(179) If a man receives \$3 per day, how much should he receive in a day and a half?

(180) A boy had 24 marbles, he lost $\frac{1}{8}$ of them; how many had he left?

(181) If an apple and a half is worth 3c., what will 1 doz. of apples cost? 2 doz.? 100?

(182) How much longer is 1 ft. than $\frac{1}{4}$ of a yard?

(183) If you take $\frac{1}{12}$ of a yard from 12 yd., how many are left?

(184) How many more eighths of a foot are there in $16\frac{3}{4}$ ft. than in $9\frac{1}{16}$ ft.?

(185) If you have 36c.; what part of it must you pay for a 3c. stamp?

(186) If 8 baskets of peaches cost \$10.40, what would 5 baskets cost?

(187) If you had \$40 and gave away $\frac{1}{5}$ of it, spent $\frac{1}{8}$ of it, and lost $\frac{1}{3}$ of the remainder; how much would you have left?

(188) Write in words $\frac{3}{7}$, $\frac{5}{8}$, $\frac{7}{12}$, $2\frac{13}{22}$, and $\frac{79}{2000}$.

(189) Divide the sum of $3\frac{5}{8}$ and $7\frac{5}{12}$ by the difference between $7\frac{2}{9}$ and $4\frac{11}{21}$.

(190) *A* owns $\frac{1}{3}$ of a milk business; he sells $\frac{1}{2}$ of his share to *B*, and $\frac{1}{3}$ of it to *C*; what part has he left for himself, and how much less is it than *B*'s share?

(191) Bought 2 barrels of beef for \$18.75 and retailed it at $12\frac{1}{2}$c. per lb.; what was the gain?

(192) A farmer sells 6 bush. 1 pk. of peas at 30c. per pk.; how many yards of dress goods, at $37\frac{1}{2}$c. per yd., could he buy with the money?

(193) What would be the total cost of paving Jarvis street, Toronto, from Queen street to Bloor, the distance being $1\frac{1}{4}$ mi. and the street 12 yd. wide, at 75c. per sq. yd.; and the curbing on each side at 60c. per lineal foot?

(194) What would it cost to fence a field 20 rods long and 15 rods wide at 60c. per yd.?

(195) What must be paid for 832 qt. of chestnuts at \$3.50 per bush.?

(196) How many tons, cwt., etc., in 360.407 oz.?

(197) How many minutes from 9.15 a.m. till 7.20 p.m.?

(198) Find the cost of 68,000 lb. of oats at 35c. per bush.

(199) In 4 ac. 86 sq. rods 3 sq. ft., how many square inches?

(200) Divide the sum of 987,007 and 978,909 by their difference.

II.—Addition of Fractions.

(1) I own 4 village lots of $\frac{3}{4}$ ac., $\frac{7}{16}$ ac., $\frac{5}{6}$ ac., and $4\frac{5}{12}$ ac. respectively. Find the number of ac. I hold.

(2) I paid 4 bills of \$30$\frac{4}{5}$, \$4$\frac{9}{10}$, \$10$\frac{5}{6}$, and \$57$\frac{1}{3}$ each. How much money did I pay out?

(3) What is the sum of \$14$\frac{1}{5}$, \$39$\frac{7}{10}$, \$16$\frac{3}{8}$, and \$25$\frac{1}{4}$?

(4) Find the sum of \$128$\frac{1}{4}$, \$43$\frac{7}{8}$, \$435$\frac{1}{7}$, \$15, and \$$\frac{3}{4}$.

(5) Three men are to pay for a horse. The first is to pay \$41$\frac{5}{8}$; the second, \$52$\frac{1}{12}$; and the third as much as the other two. Find cost of the horse.

(6) A farmer delivered wood to me at four different times. The first time he brought $3\frac{1}{4}$ cords; the second time, $7\frac{9}{10}$ cords; the third time, $12\frac{4}{5}$ cords; and the last time, $1\frac{7}{8}$ cords. How many cords did he deliver?

(7) A certain number is made up of four addends. The first is 16; the second, $9\frac{3}{4}$; the third, $25\frac{7}{9}$; and the fourth, $\frac{1}{12}$. Find the number.

(8) Find the sum of $\frac{1}{2}$ of $\frac{2}{5}$, $\frac{4}{7}$ of 9, and $14\frac{9}{10}$.

(9) A commercial traveller in 1 wk. covers $900\frac{1}{10}$ mi.; the second wk., $450\frac{4}{5}$ mi.; and the third wk., $75\frac{19}{25}$ mi. Find the distance travelled.

(10) Add $\frac{1}{3}$ of $\frac{3}{11}$ of $\frac{1}{12}$ to $\frac{1}{2}$ of $\frac{2}{9}$.

(11) Find the sum of $17\frac{2}{3}$ and $\frac{4}{5}$ of $7\frac{5}{6}$.

(12) A farmer on one occasion delivered $\frac{4}{5}$ bush. of potatoes; on a second occasion, $7\frac{1}{2}$ bush.; and on still a third occasion he delivered $8\frac{3}{4}$ bush. Find the number of bush. delivered.

(13) To $\frac{3}{4}$ of $12\frac{2}{3}$ of $7\frac{4}{5}$ add $\frac{8}{9}$ of 25.

(14) Increase $\frac{4}{25}$ of $9\frac{3}{5}$ by $\frac{4}{21}$ of $328\frac{2}{5}$.

(15) George has \$$\frac{1}{21}$, Henry \$$\frac{1}{4}$, and James \$$\frac{1}{2}$. How much money have the three boys?

(16) How far does an agent travel in 3 dy. if he goes $6\frac{1}{3}$ mi. the first day, $3\frac{3}{4}$ mi. the second, and $8\frac{1}{2}$ mi. the third?

(17) How many bushels of wheat in 3 bins holding $125\frac{2}{9}$, $75\frac{1}{3}$ and $130\frac{4}{9}$ bush. respectively?

(18) A market gardener owning $20\frac{2}{3}$ ac. of land, bought $16\frac{5}{6}$ ac. more. How much had he then?

(19) I paid $\$4\frac{3}{4}$ for shoes, $\$\frac{1}{2}$ for rubbers, and $\$1\frac{7}{8}$ for an umbrella. Find the sum paid.

(20) A merchant bought 4 pieces of silk containing respectively $30\frac{3}{8}$, $28\frac{1}{8}$, $35\frac{1}{4}$ and 40 yd. How much silk did he buy?

(21) A miller sold $25\frac{1}{3}$ bags of grain one day, on the second day $5\frac{1}{2}$ bags more than on the first, and on the third day $15\frac{1}{6}$ bags more than on the second. How many bags did he sell?

(22) Bought 3 pieces of cloth containing $124\frac{6}{8}$, $97\frac{1}{4}$ and $45\frac{2}{3}$ yd. respectively. How many yards in the 3 pieces?

(23) A man bought $\frac{1}{4}$ of a ship, then $\frac{5}{9}$ more, and afterwards $\frac{14}{72}$ more. What portion of the ship did he then own?

(24) Four cheeses weighed respectively $46\frac{3}{8}$, $47\frac{1}{3}$, $48\frac{1}{4}$ and $55\frac{1}{4}$ lb. What was the entire weight?

(25) A merchant sold $11\frac{5}{16}$ yd. of lace to one customer, $10\frac{7}{8}$ yd. to a second, and $9\frac{3}{4}$ yd. to a third. How many yd. did he sell?

(26) The first side of a field measures $11\frac{19}{21}$ rods; the second, $14\frac{3}{7}$ rods; the third, $8\frac{6}{21}$ rods more than the first; and the fourth, $6\frac{4}{7}$ rods more than the second. Find distance around the field.

(27) A merchant sells $3\frac{1}{4}$ yd. of silk for $\$17\frac{3}{8}$, $5\frac{1}{2}$ yd. of sealette for $\$22\frac{1}{4}$, and $8\frac{1}{8}$ yd. of broadcloth for $\$27\frac{2}{5}$. How many yd. did he sell, and how much money did he receive?

(28) A grocer sells a customer $\$9\frac{1}{3}$ worth of flour, potatoes for $\$3\frac{1}{5}$, sugar for $\$1\frac{1}{8}$, $\$\frac{5}{6}$ worth of lard, and \$2.75 worth of butter. Find the customer's bill.

(29) A grain dealer buys one day on the market $175\frac{2}{7}$ bush. of wheat for $\$203\frac{2}{3}$, $321\frac{3}{7}$ bush. of barley for $\$298\frac{3}{4}$, and $270\frac{12}{21}$ bush. of corn for $\$200\frac{11}{12}$. How many bush. of grain did he buy, and what did he pay for it?

(30) A grocer bought 7 firkins of butter, weighing respectively $55\frac{1}{4}$, $54\frac{3}{4}$, $55\frac{2}{3}$, $56\frac{2}{5}$, $53\frac{7}{8}$, 56, and $55\frac{2}{9}$ lb. How much did the 7 weigh?

III.—Subtraction of Fractions.

(1) What is the difference between $\$10\frac{14}{36}$ and $\$\frac{13}{99}$?

(2) From *A* to *B* is a distance of $66\frac{2}{5}$ mi. On the road between them, at a distance of $33\frac{1}{3}$ mi. from *A*, *C* is situated. How far from *C* to *B*?

(3) One bicycle rider rode $210\frac{1}{2}$ mi. in 2 dy., while a second rode $109\frac{5}{9}$ mi. How much further does one ride than the other?

(4) How much is $\$75\frac{1}{2}$ less than \$112?

(5) How much does $606\frac{3}{4}$ exceed $70\frac{1}{2}$?

(6) Having $589\frac{2}{3}$ cwt. of flour, I sell $67\frac{3}{4}$ cwts. How much now remains?

(7) If from a bin containing $506\frac{2}{3}$ tons of coal, $418\frac{1}{2}$ tons are sold, how many tons still remain?

(8) A lady having \$25, paid $\$2\frac{1}{2}$ for a pair of gloves, $\$15\frac{3}{4}$ for a bonnet, and $\$3\frac{3}{4}$ for lace. How much money has she left?

(9) A man owned a farm of 412 ac. He sells 3 parcels of $60\frac{2}{3}$, $45\frac{1}{2}$, and $116\frac{1}{3}$ ac. respectively. How many ac. did he then have?

(10) A clerk earned \$50 per month. He paid $\$20\frac{3}{4}$ for board, $\$5\frac{3}{4}$ for washing, and $\$4\frac{3}{5}$ for other expenses. How much does he save monthly?

(11) A farmer having $125\frac{3}{4}$ bush. of potatoes, sells $78\frac{1}{2}$ bush. How much has he left?

(12) What is left after selling $18\frac{1}{2}$ yd. from a piece that originally contained $40\frac{1}{4}$ yd.?

(13) Paid $\$2,572\frac{7}{8}$ for a house, $\$1,850\frac{2}{3}$ for a lot. How much more did the house cost than the lot?

(14) The sum of two numbers is $12\frac{1}{2}$; one of the numbers is $8\frac{3}{4}$. Find the other.

(15) Bought coal for $\$14\frac{1}{2}$, wood for $\$12\frac{1}{4}$, and sold the whole for \$30. What was gained?

(16) A grocer having 32 gal. cider, sells to one customer $8\frac{1}{2}$ gal., to another $12\frac{3}{4}$ gal., and to a third $7\frac{2}{3}$ gal. How many gallons had he left?

(17) What number added to $15\frac{2}{3}$ gives $25\frac{3}{9}$?

(18) From the sum of $1\frac{1}{2}$ and $1\frac{3}{4}$ take the difference between $1\frac{7}{8}$ and $1\frac{1}{3}$.

(19) What number added to $2\frac{5}{9}$ will make $7\frac{1}{4}$?

(21) I have 2 rolls of carpet, each containing $125\frac{1}{4}$ yd. From one piece I sell $26\frac{7}{8}$ yd., and from the other $45\frac{1}{4}$ yd. How much still remains?

(21) Bought a quantity of shingles for $\$136\frac{9}{16}$, and lumber for $\$350\frac{2}{3}$. I sold the shingles for $\$184\frac{1}{2}$ and the lumber for $\$416\frac{3}{4}$. What was my gain?

(22) Simplify $(91\frac{3}{11} + 17\frac{5}{8}) - (91\frac{3}{11} - 17\frac{5}{8})$.

(23) If I spend $\$3\frac{6}{8}$ for wood and $\$11\frac{2}{6}$ for coal, what is the change due out of a $20 bill?

(24) Having gone $58\frac{4}{5}$ mi. on a journey of $175\frac{2}{10}$ mi., how far have I still to go?

(25) From $16\frac{3}{5}$ yd. lace, $12\frac{2}{13}$ yd. have been cut off. How much was left?

(26) A boy gave $18\frac{3}{4}$c. for a slate, $62\frac{1}{2}$c. for a book and $31\frac{1}{4}$c. for some paper. How much change should he receive from a $2 bill?

(27) From $\frac{2}{3}$ of $\frac{17}{20}$ take $\frac{1}{15}$ of $\frac{1}{10}$ of $7\frac{1}{2}$.

(28) Subtract $\frac{2}{3}$ of $1\frac{2}{19}$ from $\frac{1}{8}$ of $1\frac{2}{3}$ of 5.

(29) Subtract $\frac{1}{12}$ of $\frac{1}{2}$ of $1\frac{1}{4}$ from $\frac{16}{7}$ of $\frac{2}{5}$ of $\dfrac{6\frac{3}{4}}{9}$

(30) A merchant had 2 pieces of cloth of $38\frac{3}{8}$ yd. and $41\frac{4}{7}$ yd. respectively. He sold $59\frac{1}{4}$ yd. How many yards remained?

IV.—Multiplication of Fractions.

What will the cost of—

(1) $2\frac{1}{3}$ lb. of meat @ $13\frac{1}{5}$c. per lb.?

(2) $5\frac{3}{4}$ yd. of linen @ $\$\frac{2}{3}$ per yd.?

(3) $3\frac{1}{3}$ lb. of rice @ $4\frac{4}{5}$c. per lb.?

(4) $3\frac{1}{5}$ ton of iron @ $\$18\frac{3}{4}$ per ton.?

(5) $1\frac{2}{3}$ yd. of muslin @ $\$\frac{3}{20}$ per yd.?

(6) $2\frac{1}{2}$ lb. of tea @ $\$\frac{4}{5}$ per lb.?

(7) $5\frac{5}{9}$ cords of wood @ $\$1\frac{1}{5}$ per cord?

(8) At the rate of $5\frac{1}{2}$ mi. per hr., how far will a man travel in $7\frac{3}{4}$ hr.?

(9) I own $\frac{2}{3}$ of a steamboat, and sell $\frac{3}{5}$ of my share. What part of the boat do I sell?

(10) At $\$6\frac{3}{4}$ per yd., what is the cost of $\frac{2}{9}$ of a piece of cloth containing $5\frac{1}{2}$ yd.?

(11) $\frac{3}{7}$ of $\frac{5}{9}$ of $16\frac{1}{2} \times \frac{2}{3}$ of $\frac{7}{8}$ of $15 =$ what?

(12) What is the sum of $\frac{2}{3} + \frac{3}{4}$ and $\frac{2}{3} \times \frac{3}{4}$?

(13) What will 24 yd. of cloth cost at $\$3\frac{3}{4}$ per yd.?

(14) What will $6\frac{2}{3}$ bush. of wheat cost at $\$3\frac{3}{4}$ per bush.?

(15) In 3 mo. a horse consumes $\frac{3}{14}$ of $\frac{7}{9}$ of 12 tons of hay. How much does he consume?

(16) If $\frac{2}{3}$ of $\$\frac{5}{8}$ buy a bush. of corn, what will $\frac{7}{10}$ of $\frac{6}{11}$ of a bush. cost?

(17) What is the cost of $5\frac{2}{3}$ gal. of molasses at $96\frac{1}{2}$c. per gal.?

(18) What will $7\frac{1}{12}$ doz. candles cost at $\$\frac{3}{16}$ per doz.?

(19) Find the value of 175 bbl. of flour at $\$7\frac{2}{5}$ per bbl.

(20) If $\frac{3}{9}$ of $\frac{6}{7}$ of 2 yd. of cloth can be bought for $1, how much can be bought for $\frac{7}{8}$ of $\$13\frac{1}{3}$?

(21) What is the cost of $15\frac{2}{3}$ cords of wood at $\$3\frac{6}{7}$ per cord?

(22) A man who owned $\frac{3}{5}$ of a mill, sold $\frac{5}{7}$ of his share. What part of the mill did he sell?

(23) How many yards of cloth are there in $12\frac{1}{2}$ pieces of cloth, each piece containing $42\frac{3}{4}$ yd.?

(24) At $\$16\frac{7}{8}$ per ton what sum will be realized from the sale of $4\frac{4}{5}$ tons of hay?

(25) How many pounds are there in $\frac{1}{12}$ of 2 tons of coal, there being 2,000 lb. in a ton?

(26) How many yards in 6 bales of linen of 56 pieces each, if each piece be $25\frac{2}{3}$ yd.?

(27) Multiply 220 by $\frac{3}{4}$ of $\frac{5}{6}$ of $\frac{6}{8}$.

(28) If a horse eats $\frac{7}{50}$ of a ton of hay in 1 wk., how much will 7 horses eat in a year of 52 wk.?

(29) Find the cost of $3\frac{1}{2}$ bush. of potatoes at $\$\frac{1}{2}$ per bush., and $4\frac{1}{4}$ bush. of tomatoes at $\$\frac{3}{4}$ per bush.

(30) Multiply $\frac{2}{3}$ of 27 by $\frac{3}{4}$ of 24.

V.—Division of Fractions.

(1) At $\$\frac{1}{2}$ per yd., how many yd. of satin can be bought for $\$3\frac{1}{4}$?

(2) If tea cost $\$\frac{3}{5}$ per lb., how many lb. could be bought for $\$2\frac{3}{10}$?

(3) With $\$42\frac{1}{2}$, how many yd. of cloth can be purchased at $\$3\frac{3}{4}$ per yd.?

(4) By what must $\frac{3}{8}$ be multiplied to give a product of 10?

(5) At $37\frac{1}{2}$c. per bush., how many bush. of barley can you buy for $\$5.81\frac{1}{4}$?

(6) How many pieces of ribbon, $\frac{2}{15}$ of a yd. in length, can be made from $\frac{1}{2}$ of $\frac{9}{10}$ of a yd.?

(7) If a man spends $\$\frac{2}{3}$ per day in cigars, in how many days will he spend $\$17\frac{1}{2}$?

(8) How many yd. of cloth at $\$3\frac{2}{5}$ per yd., can be bought for $\$317\frac{2}{3}$?

(9) A basket holds $\frac{3}{8}$ of a bushel of potatoes. How many times should it be filled to measure $17\frac{1}{4}$ bush.?

(10) If a family uses $\frac{2}{3}$ of a barrel of flour in 1 wk., how long will $5\frac{1}{4}$ bbl. last?

(11) If a boy does $\frac{3}{7}$ of a piece of work in 1 dy., how long would it take him to do a piece of work $3\frac{5}{9}$ times as large as the first?

(12) A certain number multiplied by $\frac{3}{7}$ is equal to $\frac{21}{35}$. What is that number?

(13) If a man saws $1\frac{1}{4}$ cords of wood in 1 dy., how long will he require to saw $17\frac{1}{5}$ cords?

(14) If a horse eats $12\frac{1}{4}$ bush. of oats in 5 wk., what does he eat in 1 dy.?

(15) When wheat is selling at $\$1\frac{7}{8}$ per bush., how many bushels can be bought for $3,168?

(16) A man divided $\$2\frac{4}{5}$ among his children, giving them $\$\frac{7}{10}$ each. How many children had he?

(17) How many times will $\frac{1}{12}$ of a gallon of beer fill a vessel holding $\frac{1}{5}$ of $\frac{4}{5}$ of a gallon?

(18) $\frac{1}{6}$ of $\frac{4}{9}$ of 27 is contained how many times in $\frac{7}{8}$ of $\frac{1}{2}$ of $42\frac{2}{3}$?

(19) If $5\frac{1}{5}$ bush. of potatoes cost $\$2\frac{3}{5}$, how much do they cost per bushel?

(20) John walks 21 mi. in $\frac{7}{9}$ of a day. How far could he walk in a whole day?

(21) If a turkey cost $\$1\frac{3}{8}$, how many could be bought for $\$12\frac{5}{6}$?

(22) At $\frac{4}{5}$ of $\$\frac{1}{3}$ per yd., how many yards of ribbon could be bought for $\$\frac{21}{25}$?

(23) If $28\frac{7}{15}$ bush. of clover-seed cost $100, what is the cost of 1 bush.?

(24) At $13\frac{7}{8}$c. per lb., how many pounds of coffee could be bought for $10?

(25) How many bushels of wheat could be bought for £24 15*s.*, at $7\frac{1}{2}$*s.* per bush.?

(26) If $\frac{18}{25}$ of an acre cost $\$711\frac{3}{5}$, what is the price of 1 acre?

(27) How many pounds of coffee can be bought for $\$78\frac{5}{7}$ at $\$\frac{3}{16}$ per lb.?

(28) How many gallons of wine can be bought for £$37\frac{1}{6}$ at £$\frac{9}{17}$ per gal.?

(29) If you buy $\frac{5}{13}$ of a yard for \$1, how many dollars will buy $1,438\frac{3}{4}$ yd.?

(30) $5\frac{1}{4}$ yd. of muslin cost \$1; at the same rate how many dollars would be needed to buy 1,000 yd.?

VI.—Promiscuous Examples in Fractions.

(1) Reduce to their lowest terms $\frac{225}{405}$, $\frac{440}{1012}$, $\frac{180}{216}$, $\frac{576}{864}$, $\frac{9504}{10368}$.

(2) Reduce to mixed numbers $\frac{5907}{25}$, $\frac{85641}{39}$, $\frac{16380}{364}$, $\frac{39270}{102}$.

(3) Reduce to improper fractions $164\frac{5}{14}$, $47\frac{42}{61}$, $104\frac{9}{112}$.

(4) Change 21 to a fraction having 25 for its denominator; 34 to 50ths; 75 to 18ths.

(5) Reduce $\frac{1}{2}$ of $\frac{3}{4}$, $\frac{3}{5}$, $1\frac{5}{8}$ to equivalent fractions having the least common denominator.

(6) The difference between two numbers is $\frac{17}{28}$, and the smaller $9\frac{4}{7}$. What is the greater?

(7) The product of two numbers is $56\frac{2}{3}$, and one of the numbers is $12\frac{1}{2}$. What is the other?

(8) What number divided by $\frac{9}{28}$ will give a quotient of $\frac{2}{3}$?

(9) What is the difference between $\frac{3}{4}$ of $6\frac{1}{3}$ and $4\frac{1}{2} + \frac{5}{6}$?

(10) A farmer had $\frac{1}{4}$ of his wheat in one bin, $\frac{1}{3}$ in another, and 60 bush. in the third. How many bush. had he?

(11) Paid $\$1\frac{1}{3}$ a bush. for 10 bush. of wheat, and $\$\frac{5}{6}$ a bush. for 14 bush. of corn. Which cost the most?

(12) How many bush. of oats, worth $\$\frac{3}{5}$ per bush., will pay for 3 barrels of flour, worth $\$9\frac{1}{2}$ a barrel?

(13) If a man has $24\frac{7}{8}$ bush of timothy seed and sells $\frac{2}{3}$ of it, how much has he left?

(14) If $\frac{1}{3}$ of $5\frac{1}{3}$ cords of wood cost $\frac{1}{4}$ of \$32, what is the cost of 1 cord?

(15) If $\frac{3}{8}$ of a farm is valued at \$1,575, what is the value of the whole?

(16) If Mr. B. bought a barrel of flour for $\$7\frac{3}{8}$, a cord of wood for $\$5\frac{7}{8}$, and gave the clerk a \$20 bill, how much change should he receive?

(17) A merchant bought 360 lb. of sugar at $11\frac{1}{8}$c. per lb., and 50 lb. of tea at $62\frac{1}{2}$c. per lb. How much did he pay for both?

(18) If a man can cut in 1 dy. $\frac{1}{2}$ of a field containing 7 ac. of wheat, how many ac. can he cut in $\frac{5}{7}$ of a dy.?

(19) What will be the cost of $3\frac{5}{12}$ doz. eggs at $18\frac{3}{4}$c. per doz.?

(20) If a man can hoe a field in $7\frac{1}{4}$ dy., how long will it take 3 men to hoe a field $2\frac{2}{3}$ times as large?

(21) From a barrel of coal oil, containing $41\frac{1}{2}$ gal., it was estimated that $\frac{1}{7}$ leaked out. If I paid \$6.15 for it, at what price per gal. must I sell the remainder to balance the loss sustained by leakage?

(22) James sold $\frac{3}{5}$ of his farm of 155 ac. to Mr. Paine, and Mr. Paine sold $\frac{2}{5}$ of what he had bought to Mr. Smith. How many ac. did Mr. Smith buy?

(23) Mr. A. built a block of stores, which cost him $\$3,122\frac{1}{4}$ for brick, $\$1,368\frac{1}{5}$ for lumber, $\$3,258\frac{3}{7}$ for labor, and $\$1.325\frac{5}{12}$ for other expenses. He sold the block for \$10,000. Did he gain or lose, and how much?

(24) There are $272\frac{1}{4}$ sq. ft. in a sq. rod. How many sq. ft. are there in $\frac{3}{5}$ of a sq. rod?

(25) I sold a house and lot for \$3,215, which was $1\frac{5}{9}$ times what it cost me. How much did it cost?

(26) How much will 8 carpenters earn in $6\frac{2}{3}$ dy., at $\$2\frac{7}{8}$ per dy.?

(27) If a man walks $3\frac{1}{4}$ mi. per hr., in how many hr. can he walk $30\frac{1}{2}$ mi.?

(28) Mr. Jones left an estate valued at \$19,000. $\frac{3}{5}$ of it was divided equally among 4 sons, and the rest equally among 3 daughters. What was the share of each?

(29) The price of maple sugar this year is only $\frac{7}{8}$ of what it was the year before. How much more would I have received last year for 3,140 lb. which I sold this year for 20c. per lb.?

(30) Custom millers take $\frac{1}{8}$ of the quantity of grain as pay for grinding it. How many bush. must a man carry to the mill so that he may bring back 14 bush. of ground provender?

(31) Add $1\frac{3}{4} \div 2\frac{1}{2}$ and $5\frac{1}{2} \div 3\frac{1}{8}$.

(32) What number divided by $\frac{3}{5}$ will give 10 for quotient?

(33) What number multiplied by $\frac{3}{5}$ will give 10 for product?

(34) What number is that, from which if you take $\frac{3}{7}$ of itself. the remainder will be 16?

(35) What number is that, to which if you add $\frac{3}{7}$ of itself, the sum will be 20?

(36) A boat is worth $900; a merchant owns $\frac{5}{8}$ of it, and sells $\frac{1}{3}$ oi his share. What part has he left, and what is it worth?

(37) I own $\frac{7}{12}$ of a ship, and sell $\frac{1}{3}$ of my share for $1,944$\frac{4}{9}$· What is the whole ship worth?

(38) What part is 3c. of $\frac{2}{3}$ of 2c.?

(39) What part of 368 is 176?

(40) From $\frac{25}{37}$ subtract the sum of $\frac{1}{8}$, $\frac{1}{18}$, $\frac{13}{111}$.

(41) From 1 subtract $\frac{3}{10}$ of $\frac{7}{12}$ of $4\frac{9}{14}$.

(42) From $\frac{2}{3} \div \frac{5}{7}$ subtract $\frac{5}{8} \div \frac{10}{11}$.

(43) If I ride 2,044 rods in $\frac{7}{15}$ of an hour, at that rate how far will I ride in $1\frac{14}{15}$ hours?

(44) What part of $1\frac{1}{4}$ ft. is $3\frac{1}{3}$ in.?

(45) Two men bought a barrel of flour; one paid 3\frac{1}{5}$, and the other 3\frac{2}{3}$. Find each man's share.

(46) *A* has $2,400; $\frac{5}{8}$ of his money + $500 is $\frac{5}{4}$ of *B*'s. Find *B*'s share.

(47) J. Jones divided his estate among his 2 sons and 3 daughters, the latter sharing equally with each other. The younger son received $2,200, which was $\frac{5}{12}$ of the share of the elder, whose share was $\frac{16}{35}$ of the whole. Find the share of each daughter.

(48) If 12 barrels of flour were given for a piece of cloth, measuring $31\frac{1}{4}$ yd., and valued at 2\frac{2}{5}$ per yd., what would be the value of 1 barrel?

(49) A grocer having $\frac{7}{8}$ of a barrel of sugar, sold $\frac{2}{7}$ of what he had for 4\frac{5}{6}$. What was the value of the barrel at the same rate?

(50) The product of $\frac{6}{7}$ of $2\frac{1}{5}$ by $\frac{2}{5}$ of $\frac{3}{4}$ of 9. is how much greater than the quotient of $7\frac{1}{9}$ divided by $\frac{7}{8}$ of $6\frac{1}{2}$?

(51) The cost of a barrel of flour is $\$6\frac{1}{5}$, and it will buy 2 barrels of apples, each of which is worth $1\frac{3}{4}$ barrels of potatoes. How many lb. of butter, at $\$\frac{5}{8}$ for 3 lb., would pay for a barrel of potatoes?

(52) The product of 3 quantities is $\frac{6}{7}$. Two of the quantities are $2\frac{1}{2}$ and $\frac{7}{9}$. What is the third?

(53) A father and son, working an equal number of days, earned $\$54\frac{7}{8}$. The father earned $\$1\frac{3}{5}$, and the son $\$\frac{9}{16}$ per dy. How many days did they work?

(54) A regiment lost in battle 250 men, which was $\frac{2}{9}$ of the regiment. What was the number of men before the battle?

(55) A merchant owning $\frac{4}{15}$ of a vessel, sold $\frac{1}{8}$ of his share for \$1,640. What was the value of the vessel at that rate?

(56) How many lemons, at $\$\frac{6}{25}$ per doz., will pay for 81 oranges, at $2\frac{1}{8}$c. each?

(57) A lad multiplying by $\frac{5}{6}$ instead of by $\frac{5}{16}$, obtained $\frac{5}{9}$ as a result. What result should he have obtained?

(58) Reduce $\dfrac{\frac{7}{9} \text{ of } 2\frac{1}{7}}{2\frac{1}{9}} \times \dfrac{\frac{2}{3}}{\frac{1}{2} \text{ of } \frac{1}{6}}$ to a simple fraction.

(59) If $\frac{3}{5}$ of a yd. of cloth cost $\$\frac{7}{9}$, what will be the cost of $2\frac{5}{6}$ yd.?

(60) If $\$23\frac{1}{4}$ are required to pay 18 men for 1 day's wages, how much would be required to pay 33 men for $15\frac{3}{4}$ dy.?

(61) If A can mow 1 ac. of ground in 3 dy., and B in 2 dy., how long would it take them both to mow it?

(62) If A and B can do a piece of work in 10 dy., and A alone can do it in 16 dy., in what time can B alone do it?

(63) Multiply $\dfrac{5\frac{1}{3}}{18\frac{2}{5}}$ by $\dfrac{11\frac{1}{12}}{12\frac{1}{10}}$.

(64) In a piece of cloth there are $36\frac{1}{4}$ yd. The piece cost $\$65\frac{1}{8}$. For what must the cloth be sold per yd., that there may be a gain of $\$18\frac{2}{25}$?

(65) How many yd. of cloth, $\frac{4}{5}$ of a yd. wide, are equal to 12 yd., $\frac{3}{4}$ of a yd. wide?

(66) How many lb. of tea, at $\$\frac{7}{8}$ per lb., will pay for $10\frac{1}{2}$ bush. of peaches, at $\$\frac{9}{10}$ per basket?

(67) A man is 56 yr. old; $\frac{3}{8}$ of his age is $\frac{7}{12}$ the age of his wife. How old is his wife?

(68) If \$45 is $\frac{5}{7}$ of my money, what part of it will that sum plus \$4$\frac{1}{2}$ be?

(69) A farmer has two fields in which he keeps all his sheep. In one there are $\frac{1}{3}$ of the whole, and in the other 148 sheep. How many sheep has he?

(70) A merchant exchanged 21 barrels of flour, worth \$7$\frac{3}{5}$ per barrel, for 24$\frac{3}{7}$ cords of wood. What did the wood cost him per cord?

(71) If I give *A* $\frac{1}{3}$ of my money, *B* $\frac{1}{4}$ of it, and *C* $\frac{1}{6}$ of it, what part of my money had I left?

(72) Mr. Smith owns $\frac{5}{7}$ of a vessel, valued at \$18,326. If he sells $\frac{2}{3}$ of his share to Mr. Brown, what part of the whole will he have left? What part will Mr. B. have? What is the value of Mr. S.'s share? Of Mr. B.'s share?

(73) After paying \$60 for a suit of clothes, I find I have $\frac{3}{7}$ of my money left. How much had I at first?

(74) A man sold $\frac{1}{2}$ of 3$\frac{1}{5}$ cords of wood for $\frac{5}{7}$ of \$8$\frac{1}{5}$. How much did he receive for it per cord?

(75) How many tons of hay will be required to keep 7 horses for 6 mo., if 9 horses eat 16$\frac{1}{3}$ tons in that time?

(76) If $\frac{3}{4}$ of a farm be sold for \$8,516, what would the whole be worth at the same rate?

(77) A gentleman spent $\frac{1}{3}$ of his income travelling, and $\frac{1}{5}$ of the remainder in the purchase of books. The rest, which was \$8,526, he expended upon paintings and other works of art. Find his annual income.

(78) Two men dug a ditch for \$53; one man worked 3$\frac{1}{2}$ dy., and dug 14$\frac{1}{2}$ rods; the other worked as many days as the first dug rods per dy. How much did each receive, if they shared in proportion to the time they worked?

(79) Two brothers together own $\frac{1}{2}$ of a flouring mill, valued at \$13,000. One owns $\frac{2}{3}$ as much as the other. What is the value of each one's share?

(80) The loss caused by a fire was \$3,856. The sum was paid by an insurance company which had insured the stock at $\frac{2}{3}$ of its value. What was the entire value of the stock?

(81) *A* can do a piece of work in 10 dy.; *B* can do the same piece of work in 8 dy. How long would it take both together to do the work?

(82) If *A* can do a piece of work in 5 dy., and *B* in 8 dy., how long will it take both to do it?

(83) *A* and *B* together can do a piece of work in 10 dy., *A* by himself takes 15 dy. How long should it take *B* to do it?

(84) A tree 124 ft. high, was broken in two pieces by falling. $\frac{3}{5}$ of the shorter piece equalled $\frac{2}{7}$ of the length of the longer piece. What was the length of each piece?

(85) A man who had spent $\frac{1}{2}$ of his money and $\$\frac{1}{2}$ more, found he had $21 left. How much money had he at first?

(86) *A*, *B*, and *C* can do a piece of work in 9 dy. *A* can do it in 25 dy., and *B* in 30 dy.; in what time can *C* do it?

(87) Two ladders will together just reach the top of a building 75 ft. high. If the shorter ladder is $\frac{2}{3}$ of the length of the longer one, what is the length of each?

(88) In 1875 a merchant's profits were $\frac{1}{5}$ of his receipts; in 1876 they decreased $\frac{1}{3}$, which diminished his profits $\frac{1}{5}$ of 2.756\frac{1}{2}$. What were his receipts in 1875?

(89) *A* and *B* together had $5,700. $\frac{2}{3}$ of *A*'s money was equal to $\frac{3}{5}$ of *B*'s. How much had each?

(90) A man engaged to work a year for $240 and a suit of clothes. At the end of 9 mo. he quit, receiving $168 and the suit of clothes. What were the clothes worth?

(91) *A* and *B* can do a piece in 12 dy. If *A* can do $\frac{3}{4}$ as much as *B*, how long will it take each to do it?

(92) Of an electric cable $\frac{1}{13}$ rests on the bottom of the sea. $\frac{1}{10}$ hangs in the water, and 234$\frac{2}{3}$ yd. are employed on land. What is the length of the cable?

(93) If $\frac{5}{7}$ of the cargo of a ship be worth $16,000, what will be the value of $\frac{2}{3}$ of $\frac{7}{8}$ of the remainder?

(94) If $\frac{2}{5}$ of 1$\frac{1}{4}$ of a property be worth $300, what will be the value of $\frac{2\frac{1}{2}}{\frac{5}{14}}$ of the property.

(95) Divide $87.50 between two men, so as to give one of them half as much again as the other.

(96) A man owns $\frac{3}{16}$ of a mine, and sells $\frac{3}{20}$ of his share. What fraction of the mine has he left?

(97) By selling a house for $3,700 I lost $\frac{3}{40}$. What would be the selling price to gain $\frac{1}{8}$?

(98) How much ore must be raised, that on losing $\frac{17}{40}$ in roasting, and $\frac{8}{19}$ of the remainder in smelting, there may result 506 tons pure metal?

(99) A tradesman adds to the cost price of his goods a profit of ⅛. What was the cost price of an article which he sells for $3.82½?

(100) *A* and *B* can do a piece of work in 6 dy.; *B* and *C* in 8 dy.; *A, B,* and *C* in 4 dy. How long would *A* and *C* take to do it?

VII.—Decimal Fractions.

INTRODUCTORY.

(1) Read ·1; ·6; ·9; ·45; 11·4; 13·47; 51·67; 6·15; 8·24; 98·34; 100·1; 345,693·71.

(2) Read 100·73; 27·02; 50·57; 6·67; 41.01; 120·03; 200·01.

(3) Read 1·111; ·567; ·004; 75·123; 3·004; 1·012.

(4) Read 92·009; 9·00012; 13·8947; 63·8476; 1·0096.

(5) Read, pronouncing separately the order of each digit in the fractional parts, thus, 67·48 (67 and 4 tenths 8 hundredths): 11·6; 376·4285; 5·08; 7·360; 25·02805; 26·008; 21·3856974; 29·0101; 3·3968421; 13·11.

(6) Read the following as mixed decimals, that is, the units first, then the decimal, thus, 67·48 (67 and 48 hundredths): 28·035; 2·008; 3·5842; 20·05; 48·039; 7·8546; 94·89215; 46·38054; 21·35; 6·00001.

(7) Read the following as improper fractions, thus, 67·48 would be read 6748 hundredths: 9·164; 5·02; 135·86; 1·0101; 63·08; 4·005; 469·3; 6·00025; 526·8; 385·0468.

(8) Write in figures:—Three and fifteen hundredths; thirty-one and one thousandth; twelve and fifteen hundredths; three hundred and sixteen and fifteen thousandths; seventy-three ten thousandths; seven ten thousandths.

VIII.—Addition of Decimals.

	(1)		(2)		(3)		(4)		(5)	
(6)	14·3	+	2·348	+	4·56	+	17·01	+	384·9	=
(7)	9·58	+	8·71	+	6·54	+	·004	+	15·401	=
(8)	73·374	+	9·234	+	3·042	+	9·345	+	3·789346	=
(9)	1·583	+	5·006	+	7·1	+	7·2003	+	100·007384	=
		+		+		+		+		=

(10) Six marble slabs weigh respectively 5·73 cwt., 4·834 cwt., 7·938 cwt., 6·4 cwt., 15 cwt., and 387·1 cwt. Find total weight.

(11) A train on the Canada Southern R.R. ran 56·3 mi. in the first hr., 62·34 mi. in the second, 59·247 mi. in the third, 60·7304 mi. in the fourth. How many mi. were run during the trip?

(12) A merchant tailor bought 2 pieces of buckskin, each containing 56·34 yd.; 2 pieces of rep, each containing 96·05 yd.; and 1 piece of broadcloth, containing 27·2 yd. Find the number of yd. in the 5 pieces.

IX.—Subtraction of Decimals.

(1) 73845·009 – 1·23456.

(2) 9384·708 – 2·3457.

(3) 342·5703 – ·1994.

(4) 6534·70045 – 3·7634.

(5) 897·309 – 3·1073.

(6) 328·00019 – 6·0004.

(7) From a lot containing 10,000 sq. yd. 437·296 sq. yd. are sold. How large is the remaining part?

(8) From 17·256 tons of coal 5·625 tons were used. How much was left?

(9) The French metre is 39·37079 inches. How much longer than a yard is it?

(10) Find the difference in height of 2 flag-staffs, the one measuring 38·75 ft., the other 53·9 ft.

(11) Find the difference between ·57 and ·7; between eight hundred and fifty-two ten thousandths and one.

X.—Multiplication of Decimals.

(1) ·0009 × ·0543.

(2) 9·00134 × 8·004.

(3) ·195 × ·00027.

(4) ·1825 × 18·24.

(5) ·75 × ·30052.

(6) 84·008 × 1000·4.

(7) 258·01 × 3030·1.

(8) ·98 × 36·0007.

(9) ·357 × 88345·4.

(10) 28·601 × 3·425.

(11) My age is 1·075 times my brother's; if he is 30, how old am I? If he is 25, how old am I?

(12) A rectangular lot is 9·34 yd. wide, and 48·5 yd. deep. What is its area?

(13) Find the area of a field ·876 mi. by ·0056 mi.

(14) At $5.87 per ac., what is the rent of a farm of 47·9 ac.?

(15) If I buy 2 cwt. 66 lb. of sugar at $13.09 per cwt., and sell at $·12 per lb., what do I gain or lose on the whole?

XI.—Division of Decimals.

(1) ·0013409 ÷ ·583.

(2) ·0000026 ÷ ·004.

(3) 5941·8623 ÷ 66·77.

(4) 37·873565 ÷ 8·765.

(5) ·0897688 ÷ ·0202.

(6) 245·8677645 ÷ 405.

(7) 20·34407403 ÷ ·21.

(8) 12345·4321 ÷ 111·11.

(9) 1·33709774 ÷ 11111.

(10) 72·01440072 ÷ 8·0008.

(11) The circumference of a circle is 3·14 times the length of the diameter. Find the diameter of a circle whose circumference is 51·339 yd.

(12) The area of a rectangle is 3414·012 sq. yd.; its width is 125·7 yd. What is its length?

(13) 56·325 cwt. of certain goods cost $49·45335. What is the cost of 1 cwt.? Of 1 lb.?

(14) 36·35 yd. of cloth cost $117·95. What does 1 yd. cost at the same rate?

(15) The product of two quantities is ·2451015; one of them is ·0063. Find the other.

XII.—Reduction of Decimals.

Find the sum of—

(1) 4$\frac{3}{8}$, 524·2$\frac{1}{8}$, 6·2$\frac{3}{4}$, 7, and ·573$\frac{3}{5}$.

(2) 3$\frac{4}{5}$ mi., 5$\frac{5}{8}$ mi., 4·7 mi., 7·11 mi., and 99·9$\frac{1}{5}$ mi.

(3) 4·79 lb., 9$\frac{4}{5}$ lb., 10$\frac{9}{20}$ lb., 38·59$\frac{1}{8}$ lb., 141·1 lb.

(4) ·125 rods, ·1875 rods, $\frac{5}{8}$ rods, ·5$\frac{5}{16}$ rods, 1·8$\frac{3}{4}$ rods.

(5) 1927·96$\frac{1}{2}$$\frac{3}{5}$ ac., ·00$\frac{4}{25}$ ac., 50·267 ac., 1·709 ac.

Find the difference between—

(6) 1·79$\frac{1}{2}$ and ·777$\frac{1}{8}$; 11·111$\frac{1}{16}$ and 11·110$\frac{1}{16}$.

(7) 1·001$\frac{1}{8}$ and 10·100$\frac{1}{4}$; 7·9753$\frac{2}{3}$ and 6·428104$\frac{1}{5}$.

(8) What number divided by 1·25 will give the product 11 × 1·1 × ·001$\frac{1}{10}$?

(9) What was paid for 100 barrels of flour, each 196 lb., at \$6·66$\frac{2}{3}$ per 100 lb.? For 100 barrels of pork, each 200 lb., at \$·08$\frac{1}{4}$ per lb.?

(10) How many wagon loads in a freight car containing 2$\frac{3}{16}$ tons sheet copper, 3·75 tons sheet lead, 5$\frac{7}{8}$ tons sheet iron, 7·9375 tons tin plate; 1$\frac{3}{8}$ tons being a wagon load?

(11) From a sheet of lead weighing 1560·625 lb., circular discs were cut, weighing respectively 13$\frac{1}{4}$ lb., 17$\frac{1}{3}$ lb., 98·875 lb., 59·625 lb., 137$\frac{1}{16}$ lb., 122$\frac{5}{12}$ lb., 121$\frac{1}{4}$ lb. What was the weight of the scraps remaining?

XIII.—Premiscuous Examples in Decimals.

(1) The area of a rectangular garden is 4133·64 sq. yd.; its length is 76 yd. Find the width.

(2) 158 logs measure 3105·648 ft. What do they average?

(3) Divide $\frac{4}{5}$ of 8·236 by ·138 of $\frac{9}{10}$.

(4) What decimal of 2$\frac{1}{2}$ yd. is $\frac{1}{4}$ yd.?

(5) Bought 3·75 cwt: of beef at \$·125 per lb. Find the cost.

(6) What number multiplied by 12 will produce ·1728?

(7) Divide the average of 3·079, 4·276, 5·60554 by ·006.

(8) If I walk 3·789 mi. an hr., how far can my friend walk in 5 hr. if he walks only $\frac{4}{5}$ as fast as I do?

(9) The French metre is 39·37 in. long. How many metres in 1,132·134 yd.?

(10) How much carpet 1·5 yd. wide will cover a floor 22·5 by 19·5 ft.? How many widths, the carpet being laid from end to end of the room?

(11) What decimal fraction multiplied by $\frac{2}{5}$ of $7\frac{4}{5}$ gives $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{7}{8}$?

(12) A bar of iron, 8 in. square and 1 ft. long, weighs 216·336 lb.; what is the weight of 5 pieces, respectively 3, 4, 5, 6, 7 ft. long. (Only one multiplication necessary.)

(13) What must the dividend be, if the divisor is 38·125 and the quotient 5.25?

(14) The water that will fill a can which is exactly 1 ft. long. 1 ft. wide, and 1 ft. deep, is 997·7 oz., or 62·356 lb.; hammered silver is 10·511 times heavier than an equal bulk of water. What is the weight of $2\frac{1}{3}$ cubic ft. of the silver?

(15) Increase $\frac{1}{4}$ of 7·2 by $\frac{3}{5}$ of 6·5, and subtract from the sum the product of 5 × 1·14.

(16) The use of $1,200 for 10 yr. cost Mr. A. $630. What did the use of $100 cost per yr.?

(17) Mr. Smith paid $45 a year at $4·50 per $100 for the use of a certain sum. What was that sum?

(18) Mr. C. borrowed a sum of money at $3·25 per $100 for each year, and in 5 years paid $162·50 for the use of it. What was the sum?

(19) Find the cost of 6 gal. 3 qt. of vinegar at $·125 per gal.

(20) Find the cost of $13\frac{1}{4}$ yd. of ribbon at $·2325 per yd.

(21) Find the cost of 6·25 doz. cabbage at 3c. each.

(22) If a railroad train runs 27·125 mi. an hr., in what time will it run 303·6 mi.?

(23) Find the circumference of a circle the diameter of which is 4·2 yd. (Circumference = diameter × 3·1416.)

(24) The diameter of a wagon wheel is 40 in. How many yards will the wheel progress in turning 150 times?

(25) Find the circumference of a circle, if the length of a radius is 3·75 in. If the diameter is 91·5 in. (Radius = $\frac{1}{2}$ diameter.)

(26) A block of gold measuring 1 in. long, 1 in. wide, 1 in. thick, weighs ·7003 of a lb. How much does a cubic ft. weigh?

(27) If I add the product of 11·111 by 22·02 to 33·033, and from this sum subtract 277·69721, what is the remainder?

(28) If you subtract the product of 5 × 31·565 from the sum of the two products 15 × ·178 and 50·05 × 3·1, what will remain?

(29) Find the total freight charges, at $\frac{7}{8}$c. per ton per mi., on the following machinery shipped from Quebec to Toronto, a distance of 439 mi.:—15,000 lb. locomotive castings, 31,750 lb. flour-mill machinery, 17,570 lb. pumping machinery, 49,975 lb. saw-mill machinery.

(30) Find the cost of 978 tons steel rails at $40·33$\frac{1}{3}$, freight being 1$\frac{5}{6}$c. per ton per mi.; rails ordered in Montreal and shipped to Sarnia, a distance of 571 mi.

THE METRIC SYSTEM.

The metric standard for the measurement of distance is the **Metre,** which is 39·3707 inches long.

From the *metre* all other measures of this system are derived, hence the name **Metric System.**

A cubic decimeter ($\frac{1}{10}$ of a metre) is called a **Litre** (pronounced Lee′-ter) and is the standard for both dry and liquid measure.

The weight of so much pure water as would exactly fill a cubic centimetre ($\frac{1}{100}$ of a metre) is the standard unit of weight, and is called a **Gram.**

The following are the leading terms used:—

LINEAR.		DRY AND LIQUID.		WEIGHT.	
Mil′-li - me′-ter	(mm.)	**Milli** - li′-ter	(ml.)	**Milli** - gram	(mg.)
Cen′-ti - meter	(cm.)	**Centi** - liter	(cl.)	**Centi** - gram	(cg.)
Dec′-i - meter	(dm.)	**Deci** - liter	(dl.)	**Deci** - gram	(dg.)
Me′-ter	(m.)	**Li′-ter**	(l.)	**Gram**	(g.)
Dek′-a - meter	(Dm.)	**Deka** - liter	(Dl.)	**Deka** - gram	(Dg.)
Hec′-to - meter	(Hm.)	**Hecto** - liter	(Hl.)	**Hecto** - gram	(Hg.)
Kil′-o - meter	(Km.)	**Kilo** - liter	(Kl.)	**Kilo** - gram	(Kg.)
Myr′-i-a - meter	(Mm.)	**Myria** - liter	(Ml.)	**Mryia** - gram	(Mg.)
				Quint′-al	(Q.)
				Ton-neau′	(T.)

Notice that the abbreviations for measures *larger* than the unit begin with capital letters, the abbreviations for measures *smaller* than the unit begin with small letters.

Let the pupil drill on the prefixes until the value is fully fixed in his mind. Thus,

GREEK.	MEANING.	LATIN.	MEANING.
Deka	ten.	Deci	tenth.
Hecto	hundred.	Centi	hundredth.
Kilo	thousand.	Milli	thousandth.
Myria	ten thousand.		

XIV.—Oral Exercise.

(1) How many meters (m.) in a *myria*meter (Mm.)? In a *kilo*meter (Km.)? In a *hecto*meter (Hm.)? In a *deka*meter (Dm.)?

(2) How many *deka*meters (Dm.) in a *hecto*meter (Hm.)? In a *kilo*meter (Km.)? In a *myria*meter (Mm.)?

(3) How many *hecto*meters (Hm.) in a *myria*meter (Mm.)? In a *kilo*meter (Km.)?

(4) How many *kilo*meters (Km.) in a *myria*meter (Mm.)?

(5) What part of a m. is a *deci*meter (dm.)? A *centi*meter (cm.)? A *milli*meter (mm.)?

(6) How many mm. make 1 cm.? 1 dm.? 1 m.?

(7) How many cm. make 1 dm.? 1 m.? 1 Dm.?

(8) What part of 1 Km. is 1 cm.? 1 Hm.? 1 mm.?

(9) How many ml. in 1·5 cl.? ·75 dl.?

(10) How many grams in ·25 Mg.? $\frac{1}{8}$ Dg.?

XV.—Seat Exercise.

(1) Write the Linear Measure table, thus:—

10 millimeters = 1 centimeter.
10 centimeters = 1 decimeter.
etc.

(2) Write the Dry and Liquid Measure table in the same way.

(3) Write also the table of Weights.

(4) Write in full the following abbreviations:—m., cl., Dg., dm., Kl., cm., Mm., Hl., mm., Mg., Dm., cg., ml., Kg., Hm., Dl., mg., Km., Hg., dl., g., dg., l.

(5) Read 858·65 m., giving separately the denomination of each figure. Thus, 8 hectometers, 5 dekameters, 8 meters, 6 decimeters, 5 centimeters.

(6) In the same way read:—

295·31 m.
30·02 l.
3·892 g.
1·993 m.
384·002 g.
50·023 l.

65·12 l.
·203 l.
18·303 m.
35·5 g.
8·654 l.
·009 m.

89367·351 m.
5432·019 g.
10000·01 l.
654·321 m.
30·50 g.
123·456 g.

(7) Write 3 Kg., 5 g., 3 cg., 4 mg., in the denomination of the unit (grams.) Thus, 3005·034 g.

Note.—Be careful to fill all the intervening vacant orders with ciphers, so that each digit shall, by its position, indicate its denomination. In the quantity given above there are no hectograms, no dekagrams, no decigrams, hence the ciphers.

(8) In the same way write:—

5 Hl. 7 Dl. 8 dl. 2 cl. 5 ml.
2 Dg. 5 g. 3 cg. 8 mg.
4 Hm. 5 Dm. 3 dm. 8 mm.
3 Kg. 8 dg. 5 cg. 7 mg.

9 Kl. 8 Dl. 2 l. 3 dl.
5 Km. 8 Hm. 1 m. 3 dm.
7 Mg. 2 Dg. 3 cg. 9 mg.
5 Mm. 9 Km. 5 Hm. 8 Dm.

XVI.—Reduction.

(1) Reduce 25·325 kilometers to decimeters.

1 Km. = 10 Hm., therefore 25·325 Km. = 253·25 Hm.
1 Hm. = 10 Dm., " 253·25 Hm. = 2532·5 Dm.
1 Dm. = 10 m., " 2532·5 Dm. = 25325 m.
1 m., = 10 dm., " 25325 m. = 253250 dm.

Thus in reduction *descending*, each step removes the decimal point one place to the right.

(2) Reduce 435·32 dm. to Hm.

10 dm. = 1 m., therefore 435·32 dm. = 43·532 m.
10 m. = 1 Dm., " 43·532 m. = 4·3532 Dm.
10 Dm. = 1 Hm., " 4·3532 Dm. = ·43532 Hm.

Thus in reduction *ascending*, each step removes the decimal point one place to the left.

(3) Express the sum of 231 cm., 2859 dm., 354 mm. in meters.

(4) Add 28·35 m., 200·03 m., 123·9 m., 456·7 m., and express the answer in hectometers.

(5) Express in grams and add 127 dg., 7200 Hg., 8·33 Kg.

(6) Find how many grams remain if you take 8 Kg. from 58 Kg.

(7) A boy is told to measure the water in a vessel containing 14·31 l., with a cup holding 3 cl. How often will he have filled the cup if his measurement is correct?

(8) The circumference of a hoop is 3·8 m.; how many times will it turn in rolling 53·2 m.?

(9) A nickel 5c. piece weighs 5 grams. How many such pieces can be coined from a bar of coin metal weighing 5 Kg.?

(10) Add 4·97 m., 21 cm., 6·03 m., 9·137 m., 38 dm.

(11) Subtract 9 Km. 6 Dm. 7 m. 3 dm. from 1 Mm.

(12) Multiply 18·28 Dg. by 29. Express the product in cg.

(13) Divide 5238·45 l. by 8. Express the quotient in Dl..

(14) Sold 14·23 l. at $·50 a dl. How much did I receive?

(15) A train runs 54·5 Km. an hour. How far in 4·5 hr.?

(16) How many K. of telegraph wire is needed to connect two stations, if the distance between two poles is 43 m., and there are 516 poles between the stations?

(17) How many m. of fence is needed to close in a field 535·5 m. long and 285·5 m. wide?

(18) What will be the profit on $1\frac{1}{4}$ Hl. of vinegar bought at $4 per Hl. and sold at 8c. per liter?

(19) What will be the profit on 10 g. of calomel bought for 50c., if sold in powders of 5 dg. at 5c. each?

(20) A merchant bought cloth at $1·14 per m.; for how much per m must he sell it to gain $\frac{1}{3}$ of the cost?

XVII.—Square Measure.

100 sq. mm. = 1 sq. cm.
100 sq. cm. = 1 sq. dm.
100 sq. dm. = 1 sq. m.
100 sq. m. = 1 sq. Dm. = 1 Are.
100 sq. Dm. = 1 sq. Hm.
100 sq. Hm. = 1 sq. Km.

For land measure, the sq. Dm. is called an **Are** (pronounced like the verb *are*). The standard unit of land measure is derived directly from the dekameter, instead of from the meter, because a large unit is more convenient for measuring large surfaces. Procure a string 10 meters long and lay out a sq. Dm. on the school ground. Lay out now 1 sq. m. in a corner of the *are*, and we have a *centare*. The table for land measure is

100 Centares (Ca.) = 1 Are (a.).
100 Ares (a.) = 1 Hectare (Ha.).

As in square measure 100 units of each order make one unit of the next higher, each denomination must have two places. For the same reason, *cents* have two places in writing dollars and cents.

Compare 5 dollars 7 cents, which is written $5.07, with 5 sq. Hm. 17 sq. Dm. 6 sq. m. 5 sq. dm., which is written thus: 51706·05 sq. m.

(1) Write the following as square meters;—

7 sq. Km. 19 sq. Hm. 30 sq. Dm. 5 sq. m.
5 sq. Hm. 5 sq. Dm. 5 sq. m. 5 sq. dm. 5 sq. cm.

(2) Write the following as sq. dm.: 6 sq. Dm. 3 sq. m. 81 sq. dm. 53 sq. cm.

(3) How many centares in 19 hectares, 59 ares and 48 centares?

(4) Express in ares 58 sq. Km. 93 sq. Hm. 73 sq. Dm. 42 sq. dm.

(5) How many sq. m. in 2509703 sq. mm.? In 3502050 sq. mm.?

(6) Reduce 17·519 sq. m. to sq. cm.; also to sq. mm.

(7) If $\frac{1}{2}$ of a sq. m. cost $14.90, what will 290 sq. cm. cost?

(8) Find the area of a floor 5·2 m. long and 3·6 m. wide.

(9) How many bricks, each 20 cm. long and 10 cm. wide, will it take to pave a cellar 10 m. long and 8·5 m. wide?

(10) Reduce 2·1736 Ha. to sq. m.; 517·3 centares to sq. m.

(11) Reduce 3872847 sq. m. to a.; also to Ha.

(12) How many hectares in a lot 59 m. long and 21 m. wide?

(13) Reduce 12856 ares to hectares.

(14) Supposing your school lot to be a rectangle 140·5 m. long and 70·5 m. wide, and the buildings to occupy just 400 sq. m., what space is left for play-ground?

(15) Find how many rolls of wall paper, 10 m. long and $\frac{1}{2}$ a meter wide, are needed to paper a room, the size of which is 6·5 m. × 4·2 m., and 3·2 m. high. Deduct 2·47 sq. m. for opening.

XVIII.—Cubic Measure.

1000 cu. mm. = 1 cu. cm.
1000 cu. cm. = 1 cu. dm. = 1 Liter (capacity).
1000 cu. dm. = 1 cu. m. = 1 Stere (pro. *stair*).

WOOD MEASURE.

10 Decisteres (ds.) = 1 Stere (s.)
10 Steres (s.) = 1 Dekastere (Ds.)

Since, in cubic measure, 1000 units of each denomination makes one unit of the next higher order, each denomination must have 3 places. For instance, 3 cu. dm. would be written 0·003; 3 cu. cm. would be written 0·000003; 3 cu. mm. would be written 0·000000003.

(1) Write 319 cu. m. 99 cu. dm. 285 cu. cm. and 4 cu. mm.

(2) Express in steres 19 Ds. 6 s. 7 ds.

(3) Reduce 5 Ds. 5 s. and 6 ds. to ds.

(4) Reduce 29 cu. m. 312 cu. dm. 703 cu. cm. to cu. dm.

(5) Add 3 cu. m. 18 cu. dm. 207 cu. cm.; 385 cu. m. 230 cu. dm. 895 cu. cm. 10 cu. mm.; 831 cu. m. 300 cu. cm. Express the sum in cu. m., then in cu. dm.

(6) How many cu. m. of earth must be removed to build a cistern 3·5 m. deep, and 1·8 m. wide both ways?

(7) I had to pay $1.50 per cu. m. for excavating and removing earth. The hole made was 6·5 m. long, 5·2 m. wide, 3·3 m. deep. How much did I have to pay?

(8) How long must a pile of wood be so that it may contain 13 Steres, if it is 4·5 m. high and 2·3 m. wide?

XIX.—Simple Interest.

Find the Interest for 1 year of:—

(1) $625 at 7 %.
(2) 450 at 4½ %.
(3) 225.50 at 6 %.

(4) $680 at 3½ %.
(5) 1,250 at 2¾ %.
(6) 4,680 at 4⅓ %.
(7) 480.20 at 8½ %.
(8) 75.75 at 7⅓ %.
(9) 750 at 8·3 %.
(10) 12,555 at 3·45 %.

Find the Interest of :—

(11) $72 for 4 yr. at 5 %.
(12) 1,250 for 11 yr. at 6½ %.
(13) 70 for 4½ yr. at 5½ %.
(14) 828 for 3 yr. 7 mo. at 6 %.
(15) 824 for 11 mo. at 5¼ %.
(16) 1,460 for 300 dy. at 4¼ %.
(17) 2,190 from May 15th to Dec. 1st at 8 %.
(18) 2,920 from Jan. 2, 1888, to June 1, 1888, at 4½ %.
(19) 6,000 from Jan. 26, 1888, to Apr. 8, 1890, at 8½ %.
(20) 9,000 from Nov. 8, 1883, to Apr. 2, 1885, at 7⅓ %.

Find the Interest to the nearest cent on :—

(21) $100 from Jan. 30 to Mar. 6, 1892, at 4 %.
(22) 900 from Feb. 12 to Mar. 4, 1891, at 7½ %.
(23) 240 from May 31 to Nov. 27, 1891, at 10 %.
(24) 333 from Aug. 1 to Nov. 29, 1892, at 5 %.
(25) 672 from Feb. 28 to Oct. 25, 1892, at 4½ %.
(26) 60 from June 19 to Nov. 10, 1891, at 12 %.
(27) 600 from July 4 to Oct. 20, 1892, at 3 %.
(28) 630 from Feb. 1 to Aug. 20, 1891, at 5⅐ %.
(29) 480 from Jan. 21 to Dec. 2, 1891, at 5 %.
(30) 270 from May 10 to July 29, 1891, at 6 %.

Find the Time when :—

(31)	Principal	$400	Rate	4 %	Interest	$16.
(32)	"	750	"	5 %	"	150.
(33)	"	1,760	"	3¾ %	"	341.
(34)	"	15.75	"	4⅕ %	"	4.62.

(35)	Principal	$896	Rate	6 %	Interest	$80.64.
(36)	"	984	"	8 %	"	288.64.
(37)	"	1,200	"	6 %	"	1,200.
(38)	"	1,268.40	"	12 %	"	1,268.40.
(39)	"	40	"	7·3 %	"	·76.
(40)	"	75	"	$3\frac{13}{20}$ %	"	2¼.

Find the Rate when :—

(41)	Principal	$200	Interest	$18	Time	1 yr.
(42)	"	780	"	195	"	5 yr.
(43)	"	70	"	15.75	"	5 yr.
(44)	"	84	"	8.75	"	2½ yr.
(45)	"	825	"	211.75	"	6 yr. 5 mo.
(46)	"	9,648	"	2,546	"	7 yr. 11 mo.
(47)	"	1,533	"	89.25	"	375 dy.
(48)	"	137.50	"	3.30	"	from May 13th to Oct. 6th.
(49)	"	37½	"	$\frac{3}{5}$	"	from Apr. 3rd to Nov. 8th.
(50)	"	43¾	"	1.68	"	from Mar. 16th to Jan. 2nd.

Find the Principal when :—

(51)	Rate	3½ %	Time	1 yr.	Interest	$42.
(52)	"	7 %	"	8 yr.	"	308.
(53)	"	2½ %	"	6 yr.	"	52½.
(54)	"	5 %	"	7 yr.	"	29.75.
(55)	"	3⅓ %	"	4½ yr.	"	94.50.
(56)	"	4 %	"	1¾ yr.	"	68.25.
(57)	"	4½ %	"	1¼ yr.	"	47.25.
(58)	"	6 %	"	5⅔ yr.	"	170.
(59)	"	2⅔ %	"	4 yr. 3 mo.	"	14.45.
(60)	"	3·65 %	"	300 dy.	"	109.44.

Find Amount when :—

(61)	Principal	$750	Rate	3⅓ %	Time	5½ yr.
(62)	"	1,200	"	5¼ %	"	6 yr. 7 mo.
(63)	"	5,600	"	9⅛ %	"	300 dy.

What sum must be put at interest for :—

(64) 2 yr. at 4 % to amount to $5.40.
(65) 4 yr. at 6 % “ 12.40.
(66) 7½ yr. at 8 % “ 8.
(67) 9¾ yr. at 1 % “ 8.78.
(68) 8 mo. at 3¼ % “ 1,532½.
(69) 375 dy. at 7·3 % “ 1,290.
(70) 292 dy. at 3⅔ % “ 1,235.20.

XX.—Promiscuous Examples in Interest.

(1) $50⅝ interest is due on $450 at 4½ %. How long has the interest remained unpaid?

(2) What is the rate per cent. per annum when I pay $45 for the use of $450 for 2 yr.?

(3) In how many years will the interest equal the principal at 3 %? At 4½ %? At 6¼ %?

(4) Mr. A. had $8,000 at 4½ % and $1,000 at 6 %. At what rate must he loan both sums to one man to obtain the same annual income?

(5) Mr. B. has $3,000 invested in government bonds bearing 5½ % interest. In how many years will the interest have increased this sum to $4,320?

(6) *D* wishes to invest such a sum that at 5 % he may draw $10,000 interest in 20 yr. Find that sum.

(7) At what rate of interest will $1,268 double itself in 5 yr.? In 16⅔ yr.?

(8) An investment at 5 % made 15 yr. ago now amounts to $1,984½. What was the sum invested?

(9) The interest for 1½ yr. of a principal drawing 3⅓ % per annum is paid with 7 bush. of wheat at $$1\frac{1}{14}$ per bush. and 30 bush. potatoes at $1 per bush. What is the principal?

(10) A principal of $800 was loaned June 2, 1875, at 6 %. At what date did it amount to $838.40?

(11) A residence costing $7,500 is rented for $56¼ per month. What rate per cent. per annum does the money yield?

(12) Seven months after date a note for \$1,800 amounted to \$1,878.75. What was the rate?

(13) \$600 was put at interest at $3\frac{1}{3}$ % and \$750 at 4 %. For what time were they loaned if both sums together with interest amount to \$1,525?

(14) What principal at interest for 4 yr. at 10 % will amount to the same as \$3,500 at 5 % for the same time?

(15) *A* has invested \$5,500 at 5 % interest. *B* receives for his money \$25 more interest though invested at $1\frac{1}{4}$ % less than *A*'s. What is *B*'s principal?

XXI.—True Discount.

Unfortunately this term is frequently met with in problems which are mere gymnastics on Interest. The term is unfortunate as it is liable to give rise to confusion in the mind of the pupil, after he has met with Bank or Practical Discount. If the term discount were confined exclusively to the latter class of problem, it would save a great deal of vexation on the part of both teacher and taught.

In the following exercise the term discount is purposely avoided; the teacher can readily turn them into the form usual True Discount questions:—

(1) What sum of money placed at interest for 6 mo. at 6 % will amount to \$48.36?

(2) How much money must I deposit now at 6 % so that with principal and interest I may pay a debt of \$59.50 at the end of 3 mo.?

(3) A sum of money deposited at 6 % for 8 mo. amounts, at the end of that time, to \$118.20. Find the deposit.

(4) The amount of a certain sum for 1 mo. at 6% is \$100. Find the sum.

(5) The amount of a certain sum loaned for 9 mo. at 6 % is \$763.30. Find the interest earned.

(6) How much is interest on a sum loaned at 6 % for $6\frac{1}{2}$ mo., the amount at the end of the period being \$364.48?

(7) Mr. H owes me $968 due in 2 mo. What sum must he loan at 6 % so that at the end of the time the principal and interest together will discharge the debt?

XXII.—Compound Interest.

Find the compound interest on—

(1) $600.50 for 3 yr. 7 mo. at 6 %.

(2) $318.25 for 2 yr. 4 mo. at 7 %.

(3) $412.08 for 3 yr. 2 mo. 10 dy. at 6 %.

(4) $310.24 for 2 yr. 5 mo. 15 dy. at 8 %.

(5) $3,333, at $3\frac{1}{3}$ % semi-annually, for 1 yr. 7 mo.

(6) What amount was due Mar. 25, 1886, on $1,512 borrowed Jan. 25, 1885, with compound interest at $1\frac{1}{2}$ % quarterly?

(7) Find the amount of $3,500, at compound interest, from Oct. 29, 1884, to Nov. 15, 1885, at 2% quarterly.

(8) How much greater, at compound than at simple interest, would be the amount of $1,568 in 3 yr. 8 mo. at 6 %.

(9) Find the amount due Sept. 18, 1876, on $450, loaned Sept. 18, 1873. Interest compounded annually at $4\frac{1}{2}$ %.

(10) John Smith deposits $100 in a Savings Bank at the beginning of each year, making the first deposit Jan. 1, 1885. How much will there be to his credit Jan. 1, 1891, the bank paying 4 % per annum, calculated yearly?

XXIII.—Bank Discount and Promissory Notes.

A **Promissory Note** or simply a **Note** is a written promise to pay a specified sum of money on demand or at a certain time to some person named in the note.

The sum promised to be paid is the **Face** of the note.

The signer is called the **Maker** or **Drawer.**

The person to whom it is payable is the **Payee.**

The owner of the note is called the **Holder.**

The following is a simple form of a promissory note:—

$50.75. *Toronto, Aug. 15, 1892.*

Three months after date I promise
to pay .... W. J. Gage the sum of
Fifty $\frac{75}{100}$ *Dollars. Value received.*

A. F. Green.

(1) The time of a note should be written in words, and may be expressed in days, months, or years, or the date on which it is to be paid may be specifically stated. Thus, "on the fifteenth day of November, 1892, I promise to pay, etc." Notes in which a certain time is given for payment are called **Time Notes.**

If in place of "three months after date," the words "on demand" were used, the note would be payable on demand. It would then be called a **Demand Note.**

(2) As it now stands, the note is payable only to Mr. W. J. Gage personally. A note thus drawn cannot be transferred, and is said to be **non-negotiable.**

But if the note read, "W. J. Gage or order," Mr. Gage could make it payable to whomsoever he might order. Thus, if he wrote

Pay to J. Brown,
W. J. Gage,

then J. Brown would be the only person to whom it would be payable. But if Mr. Gage wrote

Pay to J. Brown or order,
W. J. Gage,

then J. Brown in his turn could make it payable to whomsoever he pleased, and in this way the note might pass through a dozen hands.

If the words "or bearer" followed Mr. Gage's name it would be payable to any person who might present it. Or if Mr. Gage should write only his name on the back it would then be payable to any one who might hold it, as if made payable to bearer. Such an indorsement is called an **indorsement in blank.**

A note that may be transferred from one person to another, either by delivery or indorsement, is said to be **negotiable.**

(3) The number of dollars for which the note is drawn should be specified in words, the cents may be expressed as hundredths of a dollar.

(4) The note as printed would not bear interest till due. If not then paid it would thereafter be subject to legal interest. If the words "with interest" were used and no rate specified, the note would draw interest at the legal rate from the date to time of payment. If the rate were any other than the legal rate (six per cent.) it would have to specified, as "with interest at eight per cent."

(5) If "The Bank of Hamilton, Toronto," were written after the "Fifty $\frac{75}{100}$ Dollars," then the note should be presented at the Toronto agency of the Bank of Hamilton on the last day of grace or the date of maturity. If no bank or other place is specified, the note is payable at the owner's place of business or at his residence, upon the maker's receiving notice from the holder where payment can be made. In the case of drafts the maker has the option of naming the place where he chooses to make payment.

(6) If the term "Value received" were omitted, the maker of the note might require the holder to prove that value had been received for the note. This might be somewhat inconvenient at times. The term is not necessary to the legality of the note.

(7) Formerly granted as a favor, the custom of allowing three days beyond the time agreed upon for the payment of a note or draft has grown into a very general law. The three days, however, are of no benefit to the debtor, as the interest is computed to the last **day of grace.**

(8) An **Accommodation Note** is one given by one person to another to enable that person to raise money on the security of the note at the bank, although the maker has not received value for the note. The understanding is that the person thus accommodated shall take up the note at maturity. Should he not do so, however, the maker is responsible just as if he had received value.

(9) The **Proceeds** of a note is the sum that the bank pays upon it after deducting the interest on the face or the amount of the note.

(10) The sum deducted for the payment of proceeds before a note becomes due is called **Bank Discount.**

(11) A note is said to be **payable** or to be **nominally due** at the promised time of payment. Its date of **Maturity** is three days later, the last day of grace. It then becomes **legally due.**

(12) If a note is not paid at maturity, a written notice of the failure should be sent on the last day of grace to the indorser or indorsers, otherwise they cannot be held for its payment. Such notice is called a **protest** and should be made out by a **Notary Public.** The protest fee in Canada is $1.00, which with postage and stationery makes the charges on a protest about $1.06. In order to avoid the protest charges in case of non-payment at maturity, the person discounting the note may write **protest waived** across the face of the note and sign his name. He thus intimates to the bank that he will become responsible for the note without the service of the formal protest.

(13) The dates showing when a note is payable and the date of maturity are written thus: Aug. $^5/_8$.

(14) **Joint and Several Notes.**—Frequently, for better securing of a debt, and to avoid the protest formality, a creditor demands from the bebtor a note of this form:—

$500. Toronto, Aug. 15, 1892.

Three months after date we jointly and severally promise to pay A. B. Little or order the sum of Five Hundred Dollars. Value received.

A. B. CUMMINGS.
D. E. FARWELL.

Such a note is known as a **Joint and Several Note**; and should payment not be made at maturity the holder of the note may sue either or both of the parties to the note. But should it read "we jointly promise to pay," etc., action would be entered against both of them.

XXIII.—Exercise in Writing Notes.

(1) Draw a note payable by A. B. Gordon to W. J. Gage; another to W. J. Gage *or order*; another to W. J. Gage *or bearer*.

(2) Draw a *demand note*; a *time note*. Draw a *time note* with interest at the legal rate.

(3) Draw a note in which the date of payment is specifically stated.

(4) Draw a time note in which the rate of interest is other than the legal rate.

(5) Draw a time note and indorse it in blank.

(6) Draw a demand note, payable to Jas. L. Hughes, or order, and properly indorse it to W. F. Chapman, or bearer.

(7) Draw a note to mature 3 months from the present date.

(8) Draw a note payable to order for any given sum, specifying the place and time of payment.

(9) Write two forms of negotiable notes for $3,184.25, due in 3 months, to W. David McPherson, with interest.

(10) Write a note from the following data:—Face, $5,000; negotiable; maker, A. H. Harman; payee, Walter S. Lee; payable on demand; legal rate of interest.

XXIV.—Discounting Notes.

(*a*) When the note does not bear interest.

Find the date when due, bank discount, and proceeds of :—

(1) A note of $700, dated June 25, 1891, payable in 60 dy., and dicounted at 6 %.

(2) A note of $100, dated June 20, payable in 60 dy., and discounted at 6 %.

(3) A note of $120, dated Oct. 12, payable in 30 dy., and discounted at 8 %.

(4) A note of $140, dated Jan. 15, payable in 4 mo., and discounted at 6 %.

(5) A note of $180, dated April 10, payable in 6 mo., and discounted at 8 %.

(6) A note of $250, dated Dec. 1, payable in 5 mo., and discounted at 8 %.

(7) A note of $375, dated Aug. 4, payable in 30 dy., and discounted at 6 %.

(8) A note of $600, dated Feb. 12, 1892, payable in 60 dy., and discounted at 9 %.

(9) A note of $1,200, dated Feb. 20, 1891, payable in 90 dy., and discounted at 10 %.

(10) A note of $1.780, dated Jan. 11, 1892, payable in 90 dy., and discounted at 10 %.

(*b*) When the note bears interest.

Find the date when due, time of discount, bank discount, and proceeds of the following :—

(11) $800. Toronto, Jan. 5, 1891.

Six months after date, I promise to pay to the order of R. S. Baird, at the Bank of Toronto here, Eight Hundred Dollars, with interest at eight per cent. Value received.

F. G. Harris.

(12) A note of $150, dated May 20, 1891, payable in 6 mo., with interest at 6 %, and discounted Sept. 9, 1891, at 8 %.

(13) A note of $300, dated Aug. 5, 1888, payable in 1 yr., with interest at 8 %, and discounted April 16, 1889, at 6 %.

(14) A note of $450, dated Mar. 4, 1891, due Jan. 1, 1892, with interest at 6 %, and discounted Aug. 13, 1891, at 10 %.

(15) A note of $650, dated May 16, 1888, due Sept. 1, 1890, with interest at 9 %, and discounted April 25, 1890, at 6 %.

(16) A note of $840, dated Sept. 1, 1891, payable in 6 mo., with interest at 10 %, and discounted Dec. 20, at 8 %.

(17) A note of $1,400, dated July 19, 1891, due May 1, 1892, with interest at 6 %, and discounted Jan. 17, 1892, at 10 %.

(18) A note of $2,400, dated Oct. 16, 1888, due Jan. 1, 1890, with interest at 8 %, and discounted July 26, 1889, at 10 %.

(19) $3,500. Hamilton, October 15, 1890.

One year after date, I promise to pay Adam Brown or order, Thirty-five Hundred Dollars, with interest at six per cent. Value received.

Joseph Stephens.

Discounted May 15, 1891, at 9 %.

(20) $6,000. Wingham, May 10, 1891.

One year after date, I promise to pay Robert McIndoo or order, Six Thousand Dollars, with interest at eight per cent. Value received.

Amos E. Burton.

Discounted Nov. 21, 1891, at 10 %.

(*c*) **To find the face of a note when the proceeds, time and rate are given :—**

(21) The proceeds of a note discounted at a bank for 2 mo. at 6 % is $989.50. Find the face.

(22) What must be the face of a note so that when discounted at a bank for 3 mo. at 6 % the proceeds will be $1,969?

(23) A merchant wishes to use $975, which he can secure by giving a bank note payable in 2 mo., to be discounted at 7 %. Find the face.

(24) For what sum must a note be drawn payable in 3 mo. so that when discounted at 6 % the proceeds may be $1,000?

(25) A man owes a debt of $1,375.38, which he can meet by giving his note payable in 3 mo. and discounted at 9 %. For what sum must the note be written so that the proceeds may be just large enough to discharge the debt?

(26) For what sum must a note be drawn payable in 15 dy., so that when discounted at 8 % the proceeds may be $1,257.25?

(27) A speculator wishes to raise $5,250 on an indorsed note, payable in 1 mo. 15 dy., discounted at 7 %. For what amount must he draw the note so that the proceeds may be exactly the sum?

(28) For what sum must a note be made payable in 3 mo., and discounted at 12½ %, so that the proceeds may be $1,875?

(29) A merchant wishes to raise $500 at a bank by a note for 2 mo. For what sum must the note be drawn that he may receive $500 in cash after paying the discount at 8 %?

(30) For how large a sum must a note be drawn payable in 3 mo., so that the net proceeds may be $15,000 after deducting the bank discount at 8 %?

XXV.—Partial Payments.

A **Partial Payment** is a payment in part of a note or other obligation.

An **Indorsement** is the statement of the amount of a payment and the time when it was made. It is written on the back of the note or other obligation. Never take a receipt for money paid as a partial payment on a note. The receipt is good against the person who gave the receipt, but there nothing to prevent his selling the note to a third party, ignorant of the partial payment, who, if the maker of the note were not responsible, would lose the money he paid for the note. *The only receipt for a partial payment on a note, mortgage, or other written obligation, is the indorsement on the obligation.*

(1) A note for $850, on demand with interest at 7 % and dated Jan. 1, 1892, was indorsed as follows:—April 10, 1892, $200; Sept. 15, 1892, $255. How much was due on Nov. 15, 1892? Write the note and make the proper indorsements.

(2) What is the balance due at the end of a year on a note for $1,800, dated May 15, 1891, on which the following payments have been made:—Sept. 20, 1891, $300; Jan. 18, 1892, $200; April 20, 1892, $1,000; when the rate is 7 %?

(3) $585.25. Norval, March 3, 1888.

Eight months after date, for value received, I promise to pay to Robert Harper or order, Five Hundred and Eight-five $\frac{25}{100}$ Dollars with interest at Seven per cent.

A. B. Cantelon.

This note was indorsed as follows:—June 8, 1888, $325; Aug. 4, 1888, $84.30; Sept. 2, 1888, $100. What was due on the note at maturity?

(4) A note was given, Jan. 1, 1880. for $700. The following payments were indorsed upon it :—May 6, 1880, $85 ; July 1, 1881, $40 ; Aug. 20, 1881, $100 ; Jan. 10. 1883, $350. How much was due Sept. 30, 1884, interest at 6 % ?

(5) A note for $2,500, dated July 10, 1891, bore the following indorsements :—Sept. 15, 1891, $150 ; Nov. 12, 1891, $300 ; Dec. 1, 1891, $100 ; April 3, 1892, $325 ; May 15, 1892, $275 ; Sept. 20, 1892, $1,000. How much was due Jan. 1, 1893, interest 6 % ?

(6) How much was due at maturity on a note for $2,150, dated Sept. 20, 1873, to run 2 yr. 6 mo., on which the following payments were indorsed :—Dec. 15, 1873, $75 ; Feb. 4, 1874, $200 ; April 3, 1874, $150 ; July 1, 1874, $500 ; Dec. 16, 1874, $1,000 ; rate of interest 8 % ?

(7) A note for $6,725, dated Feb. 10, 1875, had the following indorsements :—May 5, 1875, $275 ; Aug. 15, 1875. $50 ; Nov. 12, 1875, $1,000 ; Jan. 3, 1876, $184.25 ; Sept. 13, 1876, $84.10 ; Dec. 23, 1876, $1,000. How much was due Feb. 10, 1877 ?

(8) A bond was given, April 4, 1870. for $5,825, with interest at 8 %. The following payments were indorsed upon it :—May 15, 1871. $728.50 ; April 8, 1872, $1,000 ; Dec. 12, 1872, $125 ; July 9, 1873, $980 ; June 12. 1874, $1,000. How much remained due upon the bond April 4, 1875 ?

(9) Sept. 25, 1888, Jas. Thompson gave his note for $895.75 with interest at 10 %. He paid on it as follows :—Jan. 10, 1889, $25 ; Oct. 12, 1889, $200 ; Jan. 18, 1890, $75 ; Mar. 25, 1890, $187.50 ; Jan. 1, 1891, $375. How much was due when he paid the note, Nov. 15, 1891 ?

(10) Required the balance due on a note, dated Jan. 1. 1887, for $580 at 5 %. to run 2 yr., on which a payment of $85 was made every three months.

XXVI.—Trade Discount.

Find the net prices :—

	LIST PRICES.	DISCOUNTS.
(1)	$5.40	25 % and 10 %.
(2)	6.56	40 % “ 20 %.
(3)	8.35	60 % “ 5 %.
(4)	7.80	50 % “ 30 %.

	LIST PRICES.	DISCOUNTS.
(5)	$6.75	10 % and 10 %.
(6)	5.37	25 % " 33 %.
(7)	4.82	40 % " 30 %.
(8)	6.72	30 %, 10 %, and 5 %.
(9)	3.98	40 %, 20 % " 10 %.
(10)	4.97	50 %, 10 % " 10 %.

(11) I paid $1,430.75 for a lot of groceries, which was 3 % discount from the face of the bill; what was the amount of the bill?

(12) A bill of goods cost $390.45 at 25 %, and 5 % off. What was the list price?

(13) Sold 20 doz. feather dusters, giving the purchaser a discount of 10, 10, and 10 %. His discounts amounting to $325.20; how much was my price per dozen?

(14) Bought 100 doz. stay bindings, at 60c. per doz., for 40, 10, and 7½ % off. What did I pay for them?

(15) A retail dealer buys a case of slates containing 10 doz. for $50 list, and gets 50, 10, and 10 % off; paying for them within the usual time he gets an additional 2 %. What did he pay per dozen for the slates?

XXVII.—Profit and Loss.

(1) A lot is bought for $1,285 and sold at a gain of 15 %. How much is gained, and what is the selling price?

(2) If a lot is bought for $1,285 and sold at a loss of 15 %, how much is lost, and what is the selling price?

(3) If I buy goods for $288 and sell them at a gain of 45 %, what do I receive for them?

(4) When 25 % is gained, what part is gained?

(5) I sold a coat for 25 % more than the $12 that it cost me. How much did I gain? How much did I get for it?

(6) Paid $15 for a ton of hay and sold it at a loss of 20 %. How much did I lose? How much did I get for it?

(7) If I sell land that cost me $50 an acre at an advance of 10 %, how much do I get per acre?

(8) If I sell flour for $8 per barrel that cost me $6, what part of the cost do I gain? What per cent.?

(9) By selling flour at a gain of \$2 per barrel, 20 % of cost was gained. Find cost.

(10) If I sell a cow that cost me \$50 at an advance of 20 % on cost, how much will my profit be? How much do I get for her?

(11) By selling flour at \$10 per barrel, a profit of 25 % was made. Find cost.

(12) By selling goods at 66c. per yd., a profit of 10 % was made. What was the cost?

(13) By selling tea at \$·80 per lb. a loss of 20 % was incurred. What was the cost?

(14) If I get \$60 for a cow and thereby gain 20 %, what did she cost me?

(15) Bought a horse for \$150 and sold him at an advance of 20 %. What did I get for him?

(16) *A* paid \$3,500 for a house and sold it at 10 % advance. Find selling price.

(17) A dealer made a gain of 25 % on a piano costing him \$275. Find the selling price.

(18) A bookseller bought \$3,584 worth of books and sold them at a gain of 10 %. How much did he gain?

(19) A carriage is sold at a gain of 25 %. If it cost \$318.25, find the selling price.

(20) A set of harness that cost \$45 is sold at an advance of 15 %. Find the selling price.

(21) A manufacturer sold 5 doz. axes at a profit of 12 %. If they cost him \$9 per doz., find his profit.

(22) A merchant received a mantle, the invoice price of which was \$84.25. He marked it to gain 15 %. Find marked price.

(23) Brennan & Co. sell 50,000 lb. sole leather, which cost them \$6,000, at an advance of 8 %. What did they get for it?

(24) A drover sold a flock of sheep at a profit of 7 %. If they cost him \$1,500, what did he get for them?

(25) A man sold his house at a profit of 15 %. If he paid \$3,000 for it, how much did he get?

(26) A merchant bought 3,950 yd. of cotton for 9½c. per yd. How much must he get for it to gain 12½ %?

(27) A merchant desires to mark goods that cost him \$3.60 per yd. so that he may gain 33⅓ %. At what price must the goods be marked?

(28) What per cent. is gained by selling tea at \$1 which cost \$·75?

(29) What per cent. is lost by selling tea at \$·75, which cost \$1?

(30) What per cent. is lost by selling cloth at \$1.25, which cost \$1.75?

(31) Bought goods at 50c. and sold them at 60c. Find gain per cent.

(32) Goods are selling at 12½c. per yd., which cost 10c. Find gain per cent.

(33) A man bought a city lot for \$4,500 and sold it for \$5,000. Find gain per cent.

(34) Sold a quantity of potatoes for \$850, which cost me \$970. Find loss per cent.

(35) Bought a quantity of coal oil at 15c. per gal. and sold at 14⅝c. Find loss per cent.

(36) A fruit dealer bought 10 boxes oranges at \$1.75 per box. Two of the boxes were worthless, but he sold the remainder at such a price that he gained 5 % on the transaction. Find selling price per box.

(37) Bought books at a discount of 10 % from the list price and sold them at the list price. Find gain per cent.

(38) An agent gets a discount of 40 % from the retail price. What is his gain per cent. when he sells at the retail price?

(39) A merchant bought cloth at \$3.25 per yd., and after keeping it for six months sold it at \$3.75 per yd. What was his gain per cent., reckoning 6 % per annum for the use of money?

(40) Which is the more profitable, and how much per cent., to sell goods for cash at once at 25 % advance, or in 1 yr. at 30 % advance, money being worth 7 %?

(41) Mr. A. gets a discount of 30 % from the retail or list price of goods. Mr. B. gets a discount of 30 % also, and 5 % off for cash. If both sell goods at the list price, what is each one's gain per cent.?

(42) A merchant bought tea at 20 % less than its market value, and received a discount of 5 % for cash. He sold it at an advance of 15 % above its market value. What was his gain per cent.?

(43) By selling cloth at gain of 12c. per yd. I realize a gain of 8 % on the cost. What was the cost?

(44) If 25 minutes of school time given for recess be 8⅓ % of the daily session, how many hours in the session?

(45) If a book is marked at 25 % above cost, but sold at 20 % less than the marked price, find the gain or loss per cent.

(46) If 80 lb. of chickory were exchanged for 120 lb. of sugar, what per cent. is coffee worth more than sugar?

(47) The assets of a business man are $135,700, which sum is 43 % of his debts. What is his indebtness?

(48) A fruit dealer sold a lot of oranges for $337.50, which allowed him a profit of 12½ %. What did he pay for them?

(49) A city lot was sold for $25,500, the gain on the cost being 325 %. What was the cost?

(50) By selling a lot of goods for $380 I gain 3 times the per cent. that would be gained by selling them at $340. What per cent. is gained in the latter case?

(51) The price of a single ticket from Weston to Toronto is 30c., but 20 coupon tickets can be bought for $5. What per cent. is saved by buying coupon tickets?

(52) The Toronto Street Railway single fare is 5c., but a special workman's ticket is issued 8 for 25c. Find gain per cent. by taking the special ticket.

(53) 10 % of a flock of sheep were killed by dogs; 6⅔% of the rest were lost; 33⅓ % of the remaining number were sold, and 28 then remained. What was the original number?

(54) At harvest time a farmer sold 60 bush. of wheat, which was 25 % of the quantity he sent to the mill, and what he sent to the mill was 40 % of the quantity he kept over till the next spring. How many bushels had he at first?

(55) When a merchant sold goods for $261, he gained twice as much as he would have lost had he sold them for $207. What was his gain per cent.?

(56) A grocer sold butter at 12½ % profit. Had he sold it for 2c. more per pound, he would have gained 20 %. What did 50 lb. cost him?

(57) When a man sells goods at a price from which he received a discount of 30%, what is his gain per cent.?

(58) When a man can borrow money at 8 %, which is more profitable, and how much per cent., to buy goods 3% off for cash or on 3 mo. credit?

(59) When a merchant buys goods at a discount of 20% from the regular price, and sells them at 20% more than the regular price, what is his gain per cent.?

(60) Which is more profitable to sell goods *now*, that cost 18c. per yd. for 20c. per yd., or to keep them 1 yr. and sell them at 21c., when money is worth 6%? How much more profitable on an investment of $1,000?

(61) A grocer sells apples at $4.75 per barrel, making a profit of $18\frac{3}{4}$ %. What was the cost?

(62) Sold silk at $1.35 per yd. and lost 10 %. At what price per yard should I have sold it to make a profit of $16\frac{2}{3}$%?

(63) A peddler bought a stock of goods for $874, and disposed of them at a profit of 25 %. How much money did he make?

(64) If a bookseller makes 25c. on an atlas, which he sells for $1.75, what is his profit per cent.?

(65) A dealer sold two horses for $150 each; on one he gained 25%, and on the other he lost 25 %. How much did he lose by the transaction?

(66) A merchant reduced the price of a certain piece of cloth 5c. per yd., and thereby reduced his profit on the cloth from 10% to 8 %. What was the cost of the cloth per yard?

(67) Bought a piece of cashmere containing 28 yd. at $$1\frac{1}{4}$ per yd.; but finding it damaged am willing to sell it at a loss of 15 %. How much must he ask per yard?

(68) A merchant purchased 3,275 bush. of wheat, for which he paid $3,517.10; but, finding it damaged, is willing to lose 10 %. What must it realize per bushel?

(69) Bought 50 gal. molasses at 75c. per gal., 10 gal. of which leaked out. At what price per gallon must the remainder be sold that I may clear 10% on the cost of the whole?

(70) A merchant buys 158 yd. of calico, for which he pays 20c. per yd. One-half is so damaged that he is obliged to sell it at a loss of 6%. The remainder he sells at an advance of 19%. Find gain.

(71) A herd of cattle was bought in Alberta, for which $3,750 was paid. The cost of freight to Montreal was $250, and they were then sold for $5,725. Find rate per cent. of gain.

(72) A commission merchant sold a consignment of iron for $25,600, by which a gain of 31 % on the invoice was made. Allowing his 5 % commission, what was the net gain to the owner?

(73) A speculator bought 10,000 bush. of corn at 60c. per bush. In a few days he sold 7,000 bush. at 65c. per bush. Corn then falling in price he sells the rest at 55c. per bush. Find gain per cent.

(74) A real estate dealer sold a house and lot for \$12,000, which sale afforded him a profit of 33⅓% on the cost. He then invested the \$12,000 in city lots, which he was obliged to sell at a loss of 33⅓%. How much did he lose on the two deals?

(75) A bookseller purchases books from the publisher at 20% off the list price; if he retails them at the list price, what will be his per cent. of profit?

(76) If 4 articles are sold for the cost of 5, what is the gain per cent.?

(77) *A* paid \$12 for an article, which he sold to *B* at a certain gain per cent.; *B* in turn sold to *C*, at the same rate of gain, for \$14.52. Find the rate of gain.

(78) A real estate dealer built 6 houses costing \$2,500 each; on one he gained 12½%; on each of three others he gained 25%; and on the remaining two he lost 30%. Find gain or loss per cent.

(79) *A* and *B* invested equal sums of money. *A* made a gain of 25%, and *B* made 40% gain. *B*'s capital is now \$180 more than *A*'s. Find the original capital of each.

(80) What per cent is lost by marking goods at 20% above cost, and then giving a customer a discount of 20%?

(81) Wine costs \$3.60 per gal. How much water must be added so that it may be sold at \$3.60 per gal. and still make a profit of 25%?

(82) A merchant bought \$2,400 worth of goods. He sold ⅓ at a gain of 25%; ¼ at a gain of 30%; and the remainder at a loss of 15%. Find gain or loss on the bargain.

(83) *A* sells to *B* a horse which had cost him £30, at 12½% profit; *B* sold to *C* at a profit of 5% on what it cost him. What would *A* have gained per cent. had he sold directly to *C*?

(84) A grocer has 150 lb. of tea, of which he sold 30 lb. at 3*s.* 7*d.* per lb., and found he was gaining only 7½%. At what price must he sell the remainder so as to gain 10% on his whole outlay?

(85) By buying a cow for \$40 cash and selling her for \$45 on 8 months' credit, what is my gain per cent., allowing money to be worth 6%?

ONTARIO EDUCATION DEPARTMENT

EXAMINATION PAPERS.

ADMISSION TO HIGH SCHOOLS.

June, 1883.

(1) What is the object of Division? Write down the relation connecting the Divisor, Dividend, Quotient and Remainder.

Divide 108,419,716,001 by 18,748,005.

(2) Find, by casting out the nines, whether the following is correct:—349,751 × 28,637 = 10,015,819,397.

Find the weight of 500,000 bricks at 4 lb. 2 oz. each, and the cost in dollars and cents, at 27*s.* 6*d.* per 1,000, allowing 4*s.* 2*d.* to make a dollar.

(3) A merchant received from England the following invoice in sterling:—

375 tons iron plates, @ £8 15*s.* 6*d.*
107½ tons bar iron, @ £11 14*s.*
10 tons bulb iron, @ £10 10*s.*
48 tons steel, @ £18 7*s.* 6*d.*
15 tons rivets, @ £11 1*s.*
17 tons T iron, @ £15 10*s.*

Find the amount of this invoice in Canadian currency, allowing the shilling sterling to be equal to 24⅓c.

(4) At $1.75 per rod, what will it cost to fence a piece of land 63·5 rods long and 27·75 rods wide?

(5) Simplify:—

$$1 - \tfrac{1}{6} + \tfrac{1}{24} - \tfrac{61}{5040} + \tfrac{277}{72576}; \text{ and } \frac{4\tfrac{7}{10} + 5\cdot\dot{8}\dot{1} - 2\cdot5}{4\tfrac{7}{10} \text{ of } 32 \text{ of } \cdot\dot{4}\dot{5}}.$$

(6) Gunpowder is composed of nitre, charcoal and sulphur, in the proportion of 15, 3 and 2. A certain quantity of gunpowder is known to contain 20 hundredweight of charcoal; find its weight, and also the weight of nitre and of sulphur it contains.

(7) Bought 360 gal. of wine at $2.60 per gal.; paid for carriage $17.20, and for duties $86.50. If $\frac{3}{20}$ of it be lost by leakage, at what price must the remainder be sold to gain $50 on the whole transaction?

(8) Find the interest on a note for $257.81, dated January 3, 1883, and paid April 6, 1883, at 8% per annum.

(9) The length of a second's pendulum is 39·37079 in.; if 64 French metres are equal to 70 yd., by what decimal of an inch will the length of a second's pendulum differ from one metre?

(10) At what time between 4 and 5 o'clock are the hands of a clock (1) coincident, (2) at right angles?

December, 1883.

(1) Multiply the sum of 59,404 and 47,675 by their difference, and divide the product by 7 × 13 × 19.

(2) Bought oranges at the rate of 10c. per doz., and sold them at the rate of 5 oranges for 11c. How much did I gain on 11 boxes, each containing 20 doz.?

(3) A man bought a rectangular field, 40 rods long by 25 rods wide, paying therefor at the rate of $300 per acre, and then had it fenced at the rate of $1.50 per rod. Prove that the land cost him exactly 10 times as much as the fence.

(4) Divide $1,200 among *A*, *B* and *C*, so that *A* may have $70 more than *B* and twice as much as *C*.

(5) Divide the sum of $\frac{2}{5}$ of $8\frac{1}{3}$ and $2\frac{1}{7}$ of $5\frac{5}{6}$ by the difference between $\frac{3}{7}$ of $3\frac{1}{2}$ and $\frac{1}{2}$ of $\frac{1}{3}$ of $2\frac{2}{3}$.

(6) Add together 1·302, 3·2589 and 4·093. Multiply the sum by ·00297 and divide the product by 90·09. (Decimals, not vulgar fractions, to be used in doing the work, otherwise no marks to be allowed.)

(7) A farmer sold a load of hay at $16.25 per ton; the whole weight of the wagon and hay was 2,875 lb.; the wagon alone was found to weigh 1,083 lb. How much did the farmer receive for his hay?

(8) *A* can run a mile race in 5 minutes, *B* in 6 minutes. How many yards start should *A* allow *B* in order to make their chances equal?

(9) Three men can dig a certain drain in 8 dy. They work at it for 5 dy., when one of them falls ill, and the other two finish the work in 5 dy. more. How much of the work did the first man do before he fell ill?

(10) Find the interest on $275.80 for 91 dy. at 7% per annum.

June, 1884.

(1) The quotient is 12,434, the remainder 2,743, and the dividend eighty-seven millions nine hundred and eleven thousand one hundred and twenty-three. Find the divisor.

(2) Find the L.C.M. of 11, 7, 21, 28, 22, 27, 81, 243, 216, and the G.C.M. of 94,605 and 95,509.

(3) A sidereal day is 23 hr. 56 min., and the mean solar day is 24 hr. Reduce the difference between the two to the decimal of a sidereal day.

(4) Simplify:—

$$(a)\quad \frac{(3\frac{2}{5} - \frac{2}{11}) \text{ of } 6\frac{5}{12}}{1\frac{7}{10} - \frac{1}{11} \text{ of } 12\frac{5}{6}} \div (6\frac{1}{5} - 1\frac{1}{7}).$$

$$(b)\quad \frac{\frac{3}{16} \text{ of a guinea} - \frac{2}{15} \text{ of a £.}}{8s.\ 10\frac{3}{4}d.}$$

(5) A grain dealer bought 64 bags of oats, weighing (including bags) 3,616 lb. The bags averaged 1 lb. 12 oz. each. The dealer paid 34c. per bush. for the oats and sold them at $42\frac{1}{2}$c. per bush. How much was his gain?

(6) A plate of metal $\frac{1}{2}$ in. thick was burnished on one side for 11*s.* $6\frac{1}{2}$*d.*, at $2\frac{1}{4}$*d.* per sq. inch. Find the weight of the plate, supposing a cubic foot of the metal to weigh $62\frac{1}{2}$ lb.

(7) *A*, *B* and *C* do a work in 12 hr.; *A* and *B* can do it in 16 hr., and *A* and *C* in 18 hr. In what time can each do it separately?

(8) An army, in its first engagement, lost 1 in 10 in killed and wounded, and in its second engagements 3 in 25 of the remainder: there were then 3,960 men left. How many men went into the first engagement?

(9) Find the duty on 8 hogsheads of sugar, each weighing 1,200 lb. gross, at $1\frac{3}{8}$c. per lb., 16% being allowed for tare.

(10) (*a*) Find the interest on $225.40 for 16 mo. at 8% per annum.

(*b*) The amount of a certain principal was $307.20 for $3\frac{1}{2}$ yr., and $312 for $3\frac{3}{4}$ yr. Find the principal and the rate.

December, 1884.

(1) Of what number is 8,967 both divisor and dividend?

(2) Find the greatest number that will divide 11,067 and 35,602; leaving as remainders respectively 17 and 21.

(3) Find the amount of the following bill:—$12\frac{1}{2}$ yd. cassimere @ \$2.75 per yd.; $18\frac{1}{3}$ yd. silk @ \$1.17; $23\frac{3}{4}$ yd. flannel @ $37\frac{1}{2}$c.; 112 yd. print @ $9\frac{1}{3}$c.; 55 yd. shirting @ $17\frac{1}{2}$c.; $37\frac{1}{2}$ yd. tweed @ \$1.12.

(4) Simplify:—

$$(a)\ 5\tfrac{1}{2} + 2\tfrac{1}{3} \div 11\tfrac{3}{4} \times 7\tfrac{1}{2} + \frac{\$18.64}{\$1.16\frac{1}{2}}$$

$$(b)\ \left\{ \tfrac{4}{5} \times \tfrac{9}{11} \times 0{\cdot}02 \times 0{\cdot}456 \right\} \div \tfrac{16}{17} \text{ of } \tfrac{2}{3}.$$

(5) The cost of carpeting a room 15 ft. long, with carpet 27 in. wide, costing 90c. per yd., is \$22.50. What is the width of the room?

(6) A boy can do a piece of work in $4\frac{2}{3}$ dy., and a man can do the same in $\frac{3}{7}$ of the time. How many days will both working together require to do 5 times the amount of work?

(7) How much water must be added to 92 gal. of brandy, worth \$4.60 per gal., in order that the mixture may be worth only \$3.60 per gal.?

(8) Find the simple interest on \$275.60 from 18th July, 1883, till 13th September, 1884, at 6% per annum.

(9) At what time are the hands of a clock exactly 2 minute spaces apart between 4 and 5 o'clock?

June, 1885.

(1) Express in words:—17089653·005904, \$705·637 and MDCCCLXXXV.

(2) Simplify:—$\frac{7}{47}(3\frac{1}{2} + 9\frac{13}{14}) \div \frac{4}{13}$ of $\dfrac{\pounds 15\ 10s.\ 2d.}{16s.\ 2d.}$

(3) Find the value of $17{\cdot}6\dot{5}\dot{4} + 4{\cdot}\dot{8}3\dot{5} + 6{\cdot}40\dot{8}$.

(4) Make out a bill of the following goods:—23 yd. cotton @ 11c.; 13 yd. gingham @ 23c.; 25 yd. flannel @ 37c.; $18\frac{1}{3}$ yd. tweed @ \$1.50; $12\frac{1}{2}$ yd. serge @ \$1.75; $6\frac{1}{2}$ yd. broadcloth @ \$4.50.

(5) A merchant purchases sugar at \$7.50 per cwt.; at what price per pound must he sell it in order to gain 10%?

(6) Find the simple interest on \$167 for 3 yr. 9 mo. at 7% per annum.

(7) In what time will any sum of money double itself, at 6% simple interest?

(8) \$1,200 is to be divided between two persons *A* and *B*, so that *A*'s share is to *B*'s share, as 2 to 7. Find the share of each.

(9) At what two times between 3 and 4 o'clock are the hands of a watch equally distant from the figure III.

(10) A man having \$720 spends a part of it, and afterwards received $7\frac{1}{2}$ times as much as he spent; he then had \$1,305. How much did he spend?

December, 1885.

(1) Define the following terms:—Factor, Prime number, Multiplication. Write down all the prime factors of 2,310.

(2) (*a*) Reduce to simplest form:—$\frac{9534}{15663}$.

(*b*) What is the least number from which 1,224 and 1,656 may each be taken an exact number of times?

(3) A man who lost $\frac{1}{3}$ of his fortune in one year, and $\frac{2}{7}$ of the remainder the next year, had \$900 left. Find the amount of his fortune at first.

(4) What quantity taken from $159\frac{1}{7}$ will make it exactly divisible by $12\frac{5}{6}$?

(5) Express 3·74976 minutes as the decimal of a week.

(6) What will 11,750 ft. of lumber cost at \$27.50 per thousand?

(7) Name the units of length, time and sterling money.

(8) Find the simple interest on \$800 for 3 yr. at $5\frac{1}{2}$%.

(9) A cistern has three pipes; the first will fill it in 10 hr., the second in 12 hr., and the third in 15 hr. In what time will they together fill the cistern?

July, 1886.

(1) (*a*) Multiply the sum of forty-eight thousand, six hundred and thirty-nine, and thirty-nine thousand five hundred and thirty-seven by their *difference* and divide the *product* by sixty-four.

(*b*) The product of four numbers is 827,658,432; the first number is 12, the product of the second and third is 144. Find the fourth.

(2) Make out a bill of the following articles:—28½ yd. flannel @ 68c., 35 yd. calico @ 15c., 3½ doz. pairs of stockings @ $2.10, 7 pairs of gloves @ 90c., 12½ yd. linen @ $1.12, 4 pairs of muslin curtains @ $4.20.

(3) What will it cost to fence a lot 49 ft. front and 180 ft. depth at $1.15 per ft.?

(4) (*a*) A horse worth $170 and 3 cows worth $36 each were exchanged for 14 calves and $82. Find the value of a calf?

(*b*) A farmer sold an equal number of horses, cows and calves, receiving $3,540 for the whole. Valuing a horse at $69, a cow at $37 and a calf at $12, find the number of each.

(5) (*a*) What sum of money will produce $300 interest in 2½ yr., at 6% simple interest?

(*b*) At what rate per cent., simple interest, will a sum of money amount to 3 times itself in 25 yr.?

(6) Divide $1,000 among *A*, *B* and *C*, so that *A* may have $60 more than *B*, and twice as much as *C*.

(7) Five men can do a certain piece of work in 20 dy.; after working 15 dy. they are joined by another man, and the whole work is completed in 19 dy. What fraction of the work is done by the sixth man?

(8) In a 440-yd. bicycle race *A* can give to *B* 20 yd. start, and to *C* 30 yd. *B* and *C* ride a 440-yd. race, starting even. By how much does *B* win?

December, 1886.

(1) Simplify $\frac{1}{2} - \frac{2}{3}$ of $\frac{5}{8} + \frac{7}{78}$, and find how many times the result is contained in $\frac{3}{8} \div (\frac{7}{9}$ of $\frac{3}{14} - \frac{1}{8})$.

(2) Divide the product of ·037 and ·0025 by the sum of ·9, ·02 and 005.

(3) If a road is 4 rods wide, how many miles of it will make 10 acres?

(4) A lot 150 ft. long and 100 ft. wide is to be surrounded by a close board fence 6 ft. high. What will the boards cost at $12.50 per thousand feet?

(5) A farmer bought a number of horses and cows for $2,000. There were three times as many cows as horses, and a horse cost twice as much as a cow. If each horse cost $80, how many cows did he buy?

(6) A man has a salary of $400 per yr., and has $500 in the bank. If he spends $500 per yr., in what time will his money be all gone?

(7) What will a dollar amount to in 3 yr. 219 dy. at $7\frac{1}{2}\%$ per annum?

(8) A man borrows $900, for the use of which he has to pay $3 per month. How long will he have had it, when the interest is $50 on every dollar borrowed?

(9) A dealer sold an article for $8.10 and lost 10%; at what selling price would he have gained 10%?

(10) How can you tell, without actual division, whether a number can be divided by 9 without leaving a remainder?

(11) If a cow gives 12 qt. 1 pt. of milk every day, and 1 lb. 8 oz. of butter can be made from 25 qt. of milk, how many pounds of butter can be made in one week from the milk of 16 cows?

(12) A man bought a quantity of tea supposed to be done up in packages of 1 lb. each. for which he was to pay $64; on weighing them, however, it was found that each package was 1 oz. light. How much should he pay for the tea?

July, 1887.

(1) What multiple of 595 divided by 595 gives as quotient 595?

(2) Find the least common multiple of $2, $3, $4, $5, $10, $20, $50 and $100.

(3) A man owns $\frac{3}{5}$ of $\frac{5}{6}$ of $\frac{7}{10}$ of an investment; on selling $\frac{2}{7}$ of his share he finds his interest worth $100 less than before. What is the value of the whole investment?

(4) Change $\frac{1}{13}$ of $\frac{1}{3} + \frac{\frac{1}{\frac{1}{3}}}{3 + \frac{1}{4}}$ to a simple fraction.

(5) What principal will amount to $840 in 5 yr. at $4\frac{1}{2}\%$?

(6) If 1 lb. of thread makes 3 yd. of linen $1\frac{1}{4}$ yd. wide, how many pounds would make 45 yd. of linen 1 yd. wide?

(7) A man sold two farms for $3,000 each; on one he gained 20%, and on the other he lost 20%. Did he gain or lose on the whole, and how much?

(8) If a garrison of 1,000 men have provisions for 12 mo., how long will the provisions last if at the end of 2 mo. they be reinforced by 500 men?

(9) A merchant sold a piece of cloth for \$24 and thereby lost 25%. What per cent. would have been the gain had he sold it for \$34?

December, 1887.

(1) Ten cents will buy 3 oranges, 4 lemons or 5 apples. How many apples are worth as much as 5 doz. oranges and 7 doz. lemons?

(2) A man can run 100 yd. in 10 seconds. How many miles will a steamboat go in $5\frac{1}{2}$ dy. at the same rate?

(3) Find the interest on \$150 from the 16th of July to the 9th of December, at 5% per annum.

(4) A person borrows money for 6 yr. at $3\frac{1}{2}$%, and repays at the end of the time as principal and interest, \$847. How much did he borrow?

(5) A map is drawn to the scale of $\frac{1}{2}$ an inch to a mile. How many acres are represented by a square inch on the map?

(6) One workman charges \$3 for a day's work of 8 hr., and another \$3.50 for a day's work of 9 hr. Which had I better employ, and how much shall I have to pay him for work that he can do in a fortnight, working 6 hr. per day?

(7) Water in freezing expands 10%. If a cubic foot of water weighs 1,000 oz., find the weight of a cubic foot of ice.

(8) A merchant bought 1,000 yd. of carpet at 60c. per yd., and sold $\frac{2}{5}$ of it at a profit of 30%, one-half at a profit of 20% and the rest at a loss of 20%. How much did he receive for the carpet?

(9) A piece of land is surrounded by a stone wall 8 ft. high and 2 ft. thick; the land inside the wall is 100 ft. long and 50 ft. wide. How many cubic feet of stone does the wall contain?

(10) A house and lot are together worth \$2,100; $\frac{1}{4}$ of the value of the house is equal to $\frac{1}{3}$ of the value of the lot. Find the value of each.

(11) An cubical cistern is 5 ft. deep. How many gallons of water will it hold if 277·274 cubic inches make a gallon?

July, 1888.

(1) Prove the rules for division (*a*) of vulgar fractions, (*b*) of decimals, using as examples $\frac{3}{4} \div \frac{5}{7}$ and ·012 ÷ ·6.

(2) A produce merchant exchanged 48⅗ bush. of oats at 39¾c. per bush., and 13½ barrels of apples at $3.85 per barrel for butter at 37½c. per lb. How many pounds of butter did he receive?

(3) A train going 25 mi. an hour starts at 1 o'clock p.m. on a trip of 280 mi.; another going 37 mi. an hour starts for the same place at 12 min. past 4 o'clock p.m.; when and where will the former be overtaken?

(4) If in a certain town $3,093.75 was raised from a ¾% tax, what was the value of the property in the town?

(5) By selling my cloth at $1.26 per yd. I gain 11c. more than I lose by selling it at $1.05 per yd. What would I gain by selling 800 yd. at $1.40 per yd.?

(6) How many thousand shingles 18 in. long and 4 in. wide, lying ⅓ to the weather, are required to shingle the roof a building 54 ft. long, with rafters 22 ft. long, the first row of shingles being double?

(7) A farmer employs a number of men and 8 boys; he pays the boys $·65 and the men $1.10 per dy. The amount that he paid to all was as much as if each had received $·92 per dy.; how many men were employed?

(8) A field whose length is to its width as 4 to 3, contains 2 ac. 2 rd. 32 rods; what are its dimensions?

(9) A man having lost 20% of his capital is worth exactly as much as another who has just gained 15% on his capital; the second man's capital was originally $9,000. What was the first man's capital?

December, 1888.

(1) Write down neatly the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	$29.87	$31.47	$33.35	$35.00	$26.16	$48.17	....
2nd	27.38	30.05	28.39	34.83	27.67	49.99	....
3rd	19.96	29.70	29.98	36.10	25.49	47.30	....
4th	23.19	32.73	31.80	37.91	27.84	50.00	....
5th	17.84	31.19	27.36	35.55	28.10	53.94	....
6th	12.09	26.07	24.09	31.87	29.15	57.77	....
Totals.	......	......	.....	......	......	......	....

(2) If you buy 3 lb. of butter at 28c. per lb., 5 lb. of tea at 56c. per lb., 6 bars of soap at 17c. per bar, 12 gal. of oil at 27c. per gal., and 3 oranges at 40c. per doz., and the merchant throws off 10c. for each dollar's worth purchased; how much change would you get out of a $10 bill?

(3) Divide $82.60 among 27 men and 37 boys, so that each man may have three times as much as each boy.

(4) Find the interest on $387.56 from March 18th to November 19th at 6% per annum?

(5) A bushel of potatoes weighs 60 lb. If a grocer buys a ton of potatoes for $15 and sells them for 15c. per pk., how much per cent. will he gain?

(6) A barn 80 ft. long and 60 ft. wide is built on a plot of ground 308 ft. long and 204 ft. wide. The rest of the plot is covered with cordwood to a depth of 8 ft. How many cords of wood are there?

(7) The interest on $870 for 4 yr. 6 mo. is $274.05. How much will $1,000 amount to in 3 mo. at the same rate?

(8) A lot 11 rods long and 9 rods wide has a fence built round it. Outside the lot, at a distance of 2 ft. from the fence, a sidewalk 4 ft. wide is built; how many square yards of ground does the sidewalk cover?

July, 1889.

(1) A bushel of wheat weighs 60 lb. and a barrel of flour weighs 196 lb. If 3 lb. of wheat makes 2 lb. of flour, how many barrels of flour can be made from 343 bush. of wheat?

(2) Find the interest on $597.50 for 2 yr. 5 mo. 12 dy. at 8% per annum.

(3) *A* and *B* start together and walk in the same direction, *A* at the rate of 4 mi. an hour, and *B* at the rate of 3 mi. an hour. At the end of 7 hr. *A* turns and goes back. How many miles will *B* have gone when he meets *A*?

(4) The circumference of a wheel is $\frac{22}{7}$ of its diameter; find the diameter of a wagon wheel which makes 360 revolutions in going a mile.

(5) A town, whose population was 10,000, increased 10% every year for 3 yr.; what was its population at the end of that period?

(6) The map of Ontario recently issued by the Crown Lands Department is drawn on a scale of 8 mi. to 1 in. On this map the township of Scott measures $1\frac{5}{16}$ in. in length and $1\frac{1}{8}$ in. in width; how many acres does it contain?

(7) If for $7 I can have the use of $35 for 3 yr. 4 mo., how much a month shall I have to pay for the use of $8,750?

(8) It is required to build a sidewalk a quarter of a mile in length, 8 ft. wide and 2 in. thick, supported by three continuous lines of scantling 4 in. square; what will the lumber cost at $17 per thousand feet?

(9) Write down neatly the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	$28.79	$34.71	$35.33	$30.10	$27.97	$47.81	....
2nd	23.87	30.03	29.38	33.84	26.77	48.77	....
3rd	16.99	27.09	28.77	30.16	24.95	43.07	....
4th	29.13	33.72	30.81	39.17	28.47	50.05	....
5th	18.47	32.29	26.73	34.45	28.88	54.39	....
6th	19.02	27.06	29.04	29.89	29.51	61.93	....
Totals.	......	......	......	......	......	......	....

December, 1889.

(1) A fruit merchant bought a quantity of apples for $144; he sold half of them for $82.80, thereby gaining 12c. per bush. on what he sold. What did the apples cost him per bushel?

(2) Find the interest on $84.25 from April 16, 1888, to November 4, 1889, at 7% per annum (year = 365 days).

(3) A pint contains 9,000 grains of barley and each grain is $\frac{1}{3}$ of an inch long. How far would the grains 17 bush. 3 pk. 1 gal. 1 qt. 1 pt. reach if placed one after another?

(4) An orchard is $24\frac{2}{3}$ rods long, and $15\frac{1}{4}$ rods wide. At $1\frac{3}{4}$c. per cubic foot what will it cost to dig a ditch around it 3 ft. 9 in. wide and 4 ft. deep?

(5) A sold a town lot to B and gained $12\frac{1}{2}$%. B sold it to C for $306 and lost 15%. How much did the lot cost A?

(6) In a room 26 ft. 6 in. long, 16 ft. 8 in. wide, and 12 ft. 3 in. high, there are three windows, each $5\frac{1}{2}$ ft. high and 3 ft. wide. and two doors, each 7 ft. high and $3\frac{1}{2}$ ft. wide. The baseboard is 9 in. wide. How much paper, $\frac{7}{8}$ of a yard wide, will be required to cover the walls and ceiling?

(7) A farmer sells to a merchant 3,015 lb. of hay at $16 per ton, and takes in payment 6 lb. of tea at 80c. per lb., $22\frac{1}{2}$ lb. of coffee at 26c. per lb., 33 lb. of sugar at 12 lb. for a dollar, $32\frac{4}{5}$ lb. of raisins at $18\frac{3}{4}$c. per lb., 14 lb. 13 oz. bacon at 16c. per lb., and the balance in cash. How much cash does the farmer receive?

(8) Brown purchased $\frac{7}{26}$ of a mill property for $4,064.55, and Smith purchased $\frac{9}{35}$ of the same property at a rate 5% higher. What did Smith's part cost him, and what fraction of the property remains unsold?

(9) My farm contains exactly 184 ac. 76 sq. rods, $24\frac{1}{5}$ sq. yd. There are 3·85 ac. in the garden and orchard; 9·147 ac. of green crop; 76·9 ac. of grain; 23·608 ac. of meadow; 34 ac. of pasture; and the remainder is uncleared bush. What per cent. of my farm is uncleared?

(10) Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	$95.65	$89.24	$59.79	$78.04	$59.37	$98.16	....
2nd	71.58	65.41	67.24	62.49	67.02	51.42	....
3rd	58.47	57.99	50.60	71.08	82.91	76.89	....
4th	69.29	80.07	91.87	93.74	63.36	90.21	....
5th	45.81	93.56	82.54	57.96	72.12	67.96	....
6th	63.42	77.68	79.18	86.60	87.31	82.75	....
Totals.	......	......	......	......	......	......	....

July, 1890.

(1) Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	$65.95	$24.89	$79.79	$40.78	$37.59	$89.61	....
2nd	58.71	41.65	24.67	94.26	70.26	42.51	....
3rd	47.58	99.57	50.60	80.71	91.82	89.76	....
4th	29.69	70.80	87.91	74.93	36.63	21.90	....
5th	81.45	56.93	54.82	96.57	12.72	96.67	....
6th	42.63	68.77	81.79	60.86	31.87	75.82	....
Totals.	......	......	......	......	......	......	....

No marks will be allowed for this question, unless all the work is correctly done.

(2) A boy's age is $\frac{1}{5}$ of his father's. In 6 yr. it will be $\frac{1}{3}$ his father's present age. How old is he?

(3) Some Atlantic liners consume 200 tons of coal per day. They average 8 dy. out and 8 dy. back. In case of accidents they carry a supply for 4 dy. extra. How many cubic yards of the hold of such a steamer will be occupied with coal for her round trip if each ton is 33 cubic feet?

(4) In a factory 12 men, 16 women and 30 boys are employed. At the end of a week they receive $330. A man is paid as much as two women, and a woman as much as three boys. What is the share of each?

(5) A farmer whose property is assessed at $9,600, pays on the dollar, $1\frac{3}{4}$ mills for township rates; $1\frac{1}{4}$ for county rates; $1\frac{1}{2}$ for railway bonus; and $2\frac{1}{2}$ for school rate. How much does he pay in all?

(6) On June 29, 1890, I borrow $16.50, to be returned April 30, 1892. With interest at $6\frac{1}{2}\%$, what amount must I then pay?

(7) In what time would a field 80 × 60 rods, pay for under-draining lengthwise at 2c. per ft., if the field yield 2 bush., at 66c. per acre, more than before draining? The drains are 4 rods apart and the first drain runs down the centre of the field.

(8) If 18 men do $\frac{2}{3}$ of a piece of work in 30 dy. of 10 hr., in what time should 15 men do the whole, working 9 hr. per day?

(9) Two men start from the same point at the same time to walk in the same direction around a block of land $1\frac{1}{4}$ mi. on each side. *A* goes at the rate of 4 mi. and *B* 3 mi. an hour. How far will *A* walk before he overtakes *B*?

December, 1890.

(1) Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	$84.56	$74.68	$57.92	$78.81	$51.27	$73.28	....
2nd	73.55	65.43	81.47	86.57	74.23	36.19	....
3rd	91.32	47.62	90.54	64.93	83.57	75.64	....
4th	64.39	54.98	76.41	71.46	54.39	46.37	....
5th	57.95	49.17	42.86	92.78	67.44	85.16	....
6th	78.19	63.58	59.29	63.69	96.08	79.31	....
Totals.	......	......	......	......	......	......	....

(2) A person sold *A* $\frac{3}{4}$ of his land, *B* $\frac{4}{5}$ of the remainder, *C* $\frac{5}{6}$ of what then remained, and received $50 for what he had left at $60 per acre. Find the number of acres he had at first.

(3) A grocer bought 6 cwt. of sugar for $52.10; he used 65 lbs. himself and sold the rest so as to make $1\frac{1}{8}$c. per lb. profit on the whole quantity. How much per pound did he sell it for?

(4) *A* starts from Kingston to walk to Belleville, a distance of 45 mi., at $3\frac{1}{2}$ mi. an hour, and *B* starts from Belleville 3 hr. earlier at $2\frac{1}{2}$ mi. an hour. Where do they meet, and how far will *B* be from Kingston when *A* arrives at Belleville?

(5) A note for $162.50, with interest at $5\frac{1}{2}\%$, was given on January 14, 1889, and paid on November 28, 1890. What was the amount paid?

(6) A certain hall 60 ft. long is to be carpeted. It is found that by stretching the carpet lengthwise, any one of four pieces, width respectively $\frac{3}{4}$ yd., 1 yd., $1\frac{1}{4}$ yd. and $1\frac{1}{2}$ yd., will exactly fit the hall without cutting anything from the width of the carpet. If the narrowest piece, worth $1.10 per yd., be chosen, what will it cost to carpet the hall?

(7) I bought a bush farm, 180 rods long by 96 rods wide, at $12.50 per ac. I paid $14.75 per ac. for clearing and $1.35 per rod for enclosing the whole farm with wire fencing. Taking into account that I sold the wood for $1,160 and ashes for $17.20, how much has the improved farm cost me per acre?

(8) *A* loaned *B* $120 for 1 yr. and 8 mo. and received as payment in full at the end of that time $130.25. What rate per cent. interest did *B* pay?

(9) A farmer sells a merchant 30 bush. of wheat at 90c. per bush., and makes a profit of 20%; the merchant sells the farmer 5 yd. of broadcloth at \$3.60 per yd., 16 yd. of calico at 8c. per yd., and 44 yd. of cotton cloth at 13c. per yd., and makes a profit of 25%. Which gains the more by the transaction and how much?

June, 1891.

(1) Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results :—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	\$75.59	\$62.68	\$59.63	\$62.78	\$67.36	\$91.34	....
2nd	82.61	79.81	48.79	92.13	81.78	87.17	....
3rd	56.95	49.83	89.64	47.85	78.81	79.68	....
4th	91.04	75.16	46.98	39.67	59.76	95.79	....
5th	68.17	34.75	77.63	85.94	93.19	86.97	....
6th	47.80	81.14	67.19	49.85	48.77	98.99	....
Totals.	......	......	......	......	......	......	....

(2) A note of \$360, drawn April 20, 1890, is paid July 2, 1891, with interest at $7\frac{1}{2}$% per annum. Find the amount paid.

(3) Brooms are bought wholesale at \$20 per gross; what per cent. profit will be made by selling them at 20c. each?

(4) Express, as a fraction of an acre, the sum of the following:— $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{15}{16}$ of an acre; $\frac{2}{3}$ of $\frac{13}{21}$ of $\frac{63}{65}$ of 100 sq. rods; and $\frac{16}{17}$ of $2\frac{1}{8}$ times 605 sq. yd.

(5) A drover lost ·065 of his flock by wolves, ·105 by disease, and ·27 by theft. He then sold ·75 of what remained, and has 280 sheep left. Find the number of his original flock.

(6) A legacy of \$9,500 is to be divided among *A*, *B* and *C*, so that *A* will get $\frac{5}{19}$ of the whole, and *B* will get $\frac{3}{4}$ as much as *C*. Find the shares of each.

(7) The difference in weight of two chests of tea is 25 lb.; the value of both at 65c. per lb. is \$113.75. How many pounds of tea are in each chest?

(8) Find cost of digging a cellar 48 ft. long, 30 ft. wide and 6 ft. deep, at 20c. per cubic yard, and flooring it with Portland cement at 10c. per square yard.

(9) Farmer *B* sold to a merchant the following articles to apply on an overdue account of \$54.45:—1,680 lb. of hay @ \$15

per ton, $3\frac{3}{4}$ cords of wood @ $4.80 per cord, 4 barrels of apples @ $2.75 per barrel, 350 lb. of flour @ $2.50 per cwt., 30 lb. 10 oz. of butter @ 16c. per lb. Make out the account neatly, showing the balance, and to whom due.

June, 1892.

(1) Make out the following account, *neatly* and accurately, in *proper form* :—Nicholas Nickleby bought the goods from you on March 3rd, and paid you $10 on account April 8th, $3\frac{3}{4}$ lb. tea @ 80c., 300 lb. sugar @ $4\frac{3}{4}$c., 45 yd. print @ $11\frac{1}{2}$c., $2\frac{1}{4}$ gal. syrup @ 65c., $12\frac{1}{2}$ yd. towelling @ $12\frac{1}{2}$c., $\frac{3}{4}$ doz. knives and forks @ $2.50, 27 lb. cheese @ 15c., 1 lb. 10 oz. lemon peel @ 32c. per lb.

(2) A load of wood, 10 ft. long, 3 ft. 8 in. wide and 3 ft. high, was sold for $3.

(*a*) What was the price per cord?

(*b*) At $4 per cord what would the load be worth?

(3) How much will it cost to paint the outside and both floors of a two-storey cottage, 36 ft. long, 33 ft. wide and 18 ft. high, at 10c. per sq. yd. The walls to be 18 in. thick, and no allowance to be made for cornices, openings or partitions?

(4) What amount will be due July 1, 1892, on a note of $80. drawn February 6, 1892, and bearing interest at $5\frac{1}{4}\%$ per annum?

(5) What is the smallest sum of money with which you can buy chickens at 25c., or geese at 50c., or turkeys at 75c., or lambs at $3, or sheep at $5, or pigs at $7, or cows at $35, or horses at $140, and have exactly $15 left for expenses?

(6) A farmer agreed to pay his hired man 10 sheep and $160 for one year's labor. The man quit work at the end of seven months, receiving the sheep and $60 as a fair settlement. Find the value of each sheep.

(7) What decimal must be taken from the sum of $69\frac{1}{6}$, $8{\cdot}2$, $5{\cdot}445$, $\cdot065$ and $20\frac{1}{12}$, so that it will contain $6{\cdot}05$ an exact number of times?

(8) A lad earned $21.16 collecting accounts for a physician. He was allowed $5\frac{3}{4}\%$; what amount did he collect?

(9) S. S. No. 5, Esquesing, is assessed for $150,000. The trustees have built a school-house costing $1,800.

(*a*) What will the school-house cost a ratepayer whose property is assessed for $4,500?

(*b*) What would be the *rate* of taxation per annum on the whole section if the house were paid for in six equal annual payments, without interest?

TORONTO PUBLIC SCHOOLS COMBINED EXAMINATION.

Senior Fourth, 1890.

(1) In building a house $\frac{9}{20}$ of the cost was for the brickwork, $\frac{1}{4}$ for the carpenter work, $\frac{3}{20}$ for the mason work, and the remainder, amounting to $3,840, was for painting and plastering; what did the house cost?

(2) What is the interest on $375 for 3 yr. 9 mo. 25 dy. at 8%?

(3) If 12% of the trees in an orchard are pear trees, 15% peach trees, 18% plum trees, and the remainder apple trees, how many trees of each kind are in the orchard if the peach trees and plum trees together number 429?

Senior Fourth, 1891.

(1) (*a*) What per cent. of 36 is 24? 27?
 (*b*) What is 25% of $$\frac{3}{4}$? 6% of $2½?
 (*c*) What decimal part of a number is $\frac{4}{5}$%? $\frac{7}{10}$%?
 (*d*) What is $\frac{1}{8}$ of 1%, brokerage?
 (*e*) $40 is 1% of what sum of money?

(2) A man whose wages had been increased 10% was then in receipt of $12.10 per wk. How much did he receive per week before his increase?

(3) A bankrupt owes $7,850 and pays 62½c. on the dollar; how much does his creditors lose? How much per cent.?

(4) A man sold a farm for $4,500, losing thereby 10% on the cost. For what should he have sold it to have gained 5%?

(5) What principal will amount to $2,500 in 8⅓ yr. at 6% per annum, simple interest?

(6) What is rate per cent. of profit on barley, bought at 85c. and sold at $1.02 per bushel?

(7) The product of two decimals is $1\frac{1}{5}$; one of them is $\cdot 2\dot{4}\dot{5}$, find the other. What part of the greater is the smaller?

(8) If a railway train goes at the rate of 136 mi. in 2 hr. and 40 min., how many miles will it go in an hour?

(9) If a load of wood is 10 ft. long and $3\frac{1}{4}$ ft. wide, how high must it be to contain $1\frac{1}{3}$ cords?

(10) A man sold $\frac{3}{5}$ of his farm, and then $\frac{1}{3}$ of the remainder. How much of the farm did he sell altogether? If he received $1,210 from both sales at that rate, what was the value of the farm?

(11) What would it cost to paper the ceiling and walls of a room 20 ft. long, 16 ft. wide, and 10 ft. high, with paper 20 in. wide, deducting $\frac{1}{10}$ for doors and windows, at 65c. per roll (a roll being 8 yd. long)?

(12) How many bricks 9 in. long, $4\frac{1}{2}$ in. wide and $2\frac{1}{2}$ in. thick, will be required to build a wall 85 ft. long, 18 ft. high and 18 in. thick, allowing that the mortar increases the bulk $\frac{1}{16}$?

(13) Find the cost of insuring a property worth $36,000 at the rate of 80c. per $100 for 3 yr., and insured for $\frac{2}{3}$ of its value. If the agent received $\frac{1}{10}$ of the premium what would be his commission?

Senior Fourth, 1892.

(1) If 3 lb. of wheat make 2 lb. of flour, how many barrels of flour can be made from $416\frac{1}{2}$ bush. of wheat?

(2) If I sell eggs at 15c. per doz., that cost me $12\frac{1}{2}$c.; what per cent. do I make?

(3) Add without reducing to vulgar fractions $\cdot4\dot{7}\dot{2}$. $19\cdot\dot{7}$ and $\cdot\dot{0}4\dot{2}$; and divide $(\cdot0\dot{7} + 1\cdot1 + \cdot1\dot{0}\dot{1})$ by $\cdot8\dot{8}$.

(4) If for the use of $960 for 9 mo. I pay $54, what rate per cent. per annum am I charged for it?

(5) *A* can do a piece of work in $\frac{1}{3}$ of a day, *B* in $\frac{1}{4}$ of a day, and *C* in $1\frac{1}{2}$ days. How long would the three working together take to do it?

(6) A person insures his house for $\frac{3}{4}$ of its value at 80c. per $100, paying a premium of $40.80; what was the value of the house?

(7) By selling silk at $2.10 per yd. I gain $16\frac{2}{3}$%, what is my gain on a sale amounting to $33?

(8) By selling a piano for $270 a dealer loses 20%, how much would he have gained by selling it for $340?

(9) It takes 48 yd. of carpet $1\frac{1}{4}$ yd. wide to cover a room; how many more yards will it take, if the width be $\frac{3}{4}$ of a yard?

(10) What would it cost to fence a lot having a frontage of 99 ft. and a depth of 165 ft. at $2.20 per rod?

(11) At 25c. per square yard, how much will it cost to plaster the walls and ceiling of a room 30 ft. long, 15 ft. wide and 10 ft. high?

(12) At 15c. per cubic yard for the first three feet in depth, and 25c. per cubic yard for the remainder, how much would it cost to excavate a cellar 36 ft. long, 20 ft. wide, and 6 ft. deep?

Junior Fifth, 1890.

(1) If a cubic foot of water weigh 1,000 oz., what weight of water will fall on an acre of ground during a rainfall of one inch? (Cwt. = 112 lb.)

(2) A square garden, measuring on each side 40 × 50 yd., is enclosed by three lines of galvanized iron wire. Eight yards of this wire weigh a pound, and it is worth 7·5c. per lb. Find the cost of the wire.

(3) The *Chemist and Druggist* estimates that the number of pills consumed in the United Kingdom daily is 5,643,961. Taking the average weight of a pill at 3 grains, find the weight in tons of a year's supply of pills for the United Kingdom. (Cwt. = 112 lb.) Find also the number of pills consumed per week, on the average, by a family of seven persons, if the total population of the United Kingdom is 40,000,000.

(4) Two ships are built. Twice as many ship carpenters are employed about the first as about the second; the first is built in 9 mo., the second in 8 mo.; the wages of each man of the first set are 7*d*. per hr., and they work 12 hr. per day; the wages of each of the second set are 6*d*. per hr., and they work 10½ hr. per day. The cost of the first in carpenters' wages was £6,000: what was that of the second?

Junior Fifth, 1891.

(1) A man has $2,000 in the bank. He drew out $\frac{3}{5}$ of it, and then $\frac{3}{4}$ of the remainder, and afterwards deposited $\frac{1}{3}$ of what he had drawn out. How much had he then in the bank?

(2) At what price must I mark goods, which cost me $4 per yd., so that, after throwing off 10% of the marked price, I may sell it at a gain of 33⅓%?

(3) A merchant's prices are 25% above cost price. If he allow a customer 10% off his bill of goods, what profit does he make?

(4) At what rate must property, valued at $11,250, be assessed to raise $100? What would be the tax on $900 at that rate?

(5) At 5% for 2 yr. the difference between the simple and compound interest is $1.95. Find the principle.

(6) A note for $600, on which ½ of 1% per month is to be charged, if not paid when due, becomes legally payable on October 1st; how much will be required to discharge the note on the following 4th of March?

(7) A merchant bought goods for $2,000 cash, and sold them, on 9 months' credit, for $2,240.50. Find the gain on the transaction, allowing true discount at 6% per annum?

(8) My house is valued at $3,000; furniture $1,800; books and pictures $800. I insure the whole through an agent for ¾ of their value at 80c. per $100 for 3 yr. What will I have to pay?

(9) I sent $10,000 to my agent in Chicago, with instructions to buy grain at 90c. per bush. He charged 2½% commission. How many bushels did he buy?

(10) Eggs are quoted in the English market at 8*s*. per 100; what profit would you make by shipping 60 cases, each containing 30 doz., if they can be laid down in Liverpool for 15c. net per dozen?

(11) If a gallon contains 277¼ cubic inches, how deep must the oil be in a tank 4 ft. square to measure 160 gal.?

(12) The difference in area between a square inscribed in a circle and one circumscribed about the same circle, is 110 sq. yd. Find the area of the circle.

(13) *A*'s farm is ½ mi. square; *B*'s contains ½ of a square mile; *C*'s is ¼ larger than *A*'s and *B*'s put together. How many acres in *C*'s farm?

Junior Fifth, 1892.

(1) *A* can do a piece of work in 4 dy., *B* in 6 dy., *C* in 8 dy.; how long will it take *C* to finish the work, if *A* and *B* have both worked at it for 1½ dy.?

(2) A bookseller marks his goods at an advance of 33⅓% on cost, and allows a discount of 5% for cash. Find the cost of a book of which the cash price is $3.80.

(3) How much better is it to lend $400 for 2½ yr. at 6½% simple interest, than to lend it at 6% compound interest?

(4) I owe $1,439.84 and give my note for 60 dy.; what must be the face of the note to pay the exact debt, when discounted at 8% per annum?

(5) A broker receives $9,180 to invest in pork at 4½c. per lb. He charges 2% commission; how many barrels of pork does he buy?

(6) At 14½ mills on the dollar, a man, who has $400 of his salary exempt, pays $7.25; what is his total salary?

(7) A man sold 2 horses for $150 each; on one he gained 20%, and on the other he lost an equal amount. Find the loss per cent. in the latter case.

(8) A factory was insured for $10,000 at ¾% in the Royal, and for $12,000 in the Western Insurance Co'y, at ⅔%; what rate of premium is paid on the whole insurance?

(9) A train, 200 yd. long, took 45 seconds to cross a bridge 262 yd. long, at what rate per hour was the train running?

(10) The end of a round stick of timber is 2 ft. 6 in. in diameter; what will be the size of the largest square log, that can be hewn from it?

(11) How many square feet in a board 16 ft. long, 18 in. wide at one end, and 24 in. wide at the other?

(12) How much inch lumber would it take to make 20 boxes with lids, the external dimensions of each being 4 ft. long, 2 ft. wide, and 1½ ft. deep?

(13) A log 2 ft. square and 16 ft. long is sawn into inch lumber. How many feet will it make, ⅛ being lost in sawing?

Senior Fifth, 1890.

(1) A rectangular garden, 40 × 50 yd., is enclosed by three lines of galvanized iron wire. Eight yards of this wire weigh a pound, and is worth 7·5c. per lb. Find the cost of the wire.

(2) Find, in miles per hour, the speed of the following trains:

	Miles.	Hrs.	Min.
(*a*) Pacific Express, Montreal to Vancouver, C.P.R. - - - - - -	2,906	149	45
(*b*) Continental Express, Bordeaux to Paris, O.R.R. - - - - -	359	9	6
(*c*) Newspaper Express, New York to Buffalo, N.Y.C.R. - - -	440	9	30
(*d*) The Flying Scotchman, London to Edinburgh, E.C.R. - - - -	392½	8	55
(e) The Flying Dutchman, London to Didcot, G.W.R. - - - -	53	..	47

(3) Two girls, *A* and *B*, can complete a piece of embroidery in 9 dy., which *A* could perform alone in 12 dy. What part of the whole work could each do in a day? What part would be done by both together in a day? If the payment for the whole piece be £$1{\cdot}\dot{2}\dot{1}$, find what each would have earned in $5\frac{1}{2}$ dy. if they were paid in proportion to their work.

Note.—Give the answer in decimals.

(4) A bath can be filled by the cold-water pipe in 18′, and by the hot in 9′. A person leaves the bathroom after turning on both pipes simultaneously, and returns at the moment when the bath should be full. Finding, however, that the waste pipe has been open, he now closes it. In 3′ 36″ more the bath is full. Find how long the waste pipe would take to empty it.

(5) Find the day of maturity, the time to run, the discount, and the proceeds of the following note:—

$610.25. Toronto, June 12, 1885.

Sixty days after date I promise to pay to order of George Hall six hundred and ten and $\frac{25}{100}$ dollars for value received.

Discounted at 6%, July 1. Samuel Hall.

(6) A paper mill worth $30,000 was insured for an annual premium of $1\frac{2}{3}$% on 90% of its value. In the second year it was injured by fire to the amount of $1,780. How much did the mill owner save by insuring?

(7) Find how long a time would be occupied by a man in cutting a strip of grass 18 ft. wide round a circular lawn 74 ft. in diameter, walking at 3 mi. an hour with a machine 11 in. wide, allowing $8\frac{38}{77}$ min. for pauses.

(8) A man invests £4,382 12*s.* 6*d.* in the purchase of 3% stock at $77\frac{3}{8}$, and receives one year's dividend, out of which he pays an income tax of 5*d.* in the £. When the funds have risen $1\frac{1}{4}$% he sell out, and invests the proceeds in Scinde Railway Shares, paying $6\frac{1}{4}$% at $117\frac{5}{8}$. Find the difference in his net income, supposing the income tax to have risen to 8*d.* (Brokerage $\frac{1}{8}$% on every transaction.)

(9) A lady, the mother of three daughters, had a farm of 500 acres in the form of a circle, with residence in the centre. Being desirous of having her daughters near her, she gave each of them a farm in the form of a circle with a residence in the centre of each. How much did her daughters get, and how far apart were they? How much did the lady keep, and how far was each daughter from her?

Note.—To find equal distance from the vertices or angles of a triangle to a point in the triangle, divide the product of the three sides by four times the area of the triangle.

Senior Fifth, 1891.

(1) *A* has ⅝ as much money as *B*, and *B* has ⅝ as much as *C*, *C* gives *A* $35, and still has twice as much as *A*. How much money has each?

(2) A grocer sells 42 lb. of tea and sugar for $18.89. He sells the tea at 65c. per lb., and the sugar at 7c. per lb. Find how much he sold of each.

(3) Eggs are quoted in the English market at 10*s*. per 100, what profit would you make by shipping 150 cases, each containing 30 doz., if they can be laid down in Liverpool at 15½c. (net) per dozen?

(4) A man has $20,000 Bank of Commerce stock, which pays a dividend of 8%. When stock is worth 115, he sells out and invests in Bank of Toronto stock at 206, which pays a dividend of 12%, allowing his agent 1½% brokerage in each case; what is the difference in his income?

(5) What must be the face of a note, so that when discounted at a bank for 4 mo., at 8%, it will give $240?

(6) (*a*) State how you would find the volume of a globe and cone. (*b*) The surface of a square pyramid, when one side of the base and the length of the slant height from the vertex to one of the angles at the base are given? (*c*) And find the number of cubic yards removed in excavating a tunnel half a mile long in the form of a half circle, the diameter being 20 ft.?

(7) What would a Bill of Exchange on London, Eng., cost in Toronto for the amount of £8,500, after paying brokerage at ⅛%, and the rate of exchange 9⅝%?

(8) A manufacturer sells goods to a merchant at a profit of 62½%; but the merchant fails and pays 62½c. on the dollar. What per cent. will the manufacturer gain or lose on his goods?

(9) A merchant sells goods for $1,125. Half he sold at an advance of 33⅓% on the cost; ¼ at an advance of 20%, and the remainder at 10% below cost price. What did he pay for the goods?

(10) An agent sold flour on a commission of 3%, and with the proceeds minus his commission on both transactions, purchased tea on a commission of 2% on the price paid for it; his entire commission was $200. Find the amount paid for the tea?

(11) If I owe $2,000 to be paid in 4 months' time, and I pay $500 now, what extension of time ought to be allowed me for the payment of the remainder, money being worth 6% per annum?

Senior Fifth, 1892.

(1) *A* and *B* take a contract together, on which for every 6 hr. *A* works, *B* works 7½ hr.; but *A* can do as much in 3 dy. as *B* can do in 4. If *A* receives $30 for his work, what should *B* receive?

(2) A bankrupt's assets are $4,800, out of which he pays 60c. on the dollar on ⅓ of his debts, and 50c. on the remainder. What is the amount of his liabilities?

(3) What must be the face value of a note made June 15th at 3 mo., and discounted July the 12th at 8% to produce $320?

(4) A draft on London, England, for £400, costs $1,950; at what rate was sterling exchange quoted in Toronto?

(5) The owner of 3½% stock sells out at 82 and realizes $10,947, ⅔ of which he invests in 3% stock at 75, and the remainder in 4% stock at 89. Find the alteration in his income.

(6) How many pounds of tea at 64c. per lb. must a grocer mix with 4 lb. at 82c. per lb., that he may sell the mixture at 96c. and gain 33⅓% on his outlay?

(7) What is the duty at 12c. per lb., and 10% advalorem, on 500 bags of wool each containing 110 lb., valued at 18c. per lb.?

(8) If stock at 4% discount will pay 6% interest on the investment, at what rate of discount would it have to be bought to pay 8% interest?

(9) A merchant lost 12% of his goods, and sold the remainder at an advance of 20% on cost, gaining $231 on the whole transaction. What did his goods cost?

(10) What should be the height of a cylindrical hot water boiler to contain 40 gal., its diameter being one foot. (1 gal. = 277·274 cubic inches)?

(11) How many water pipes 1½ in. bore will run off as much water as a pipe the bore of which is 1 ft. in diameter?

(12) Find the volume of the greatest sphere which can be cut out of a cubical block, whose edge is 6 in.?

(13) A balloon is composed of a hemisphere and a cone on the opposite sides of the same circular base; the diameter of this base is 10 ft., and the height of the cone is 12 ft. How many cubic feet of gas would it hold?

ONTARIO EDUCATION DEPARTMENT.

THIRD CLASS AND PRIMARY.

June, 1886.

(1) *A* had \$7 less than *B* had, and *B* had \$10 less than *C* had. *A* gave \$5 to *B* and \$12 to *C*. How many dollars had *C* more than *A* then?

(2) One-quarter of the time which a man spent on a journey from M to T he travelled by steamboat at an average rate of 14 mi. an hour; $\frac{2}{3}$ of the time he travelled by railway-train at an average rate of 25 mi. an hour; and the remaining hour of the time he rode the remaining 7 mi. of his journey. Find the distance from M to T.

(3) At what time between 4 and 5 p.m. is the minute-hand exactly two minute-spaces ahead of the hour hand of a watch marking correct time?

(4) A man, assisted part of the time by a boy, completed a job in 15 hr. The man received $\frac{5}{6}$ of the pay and the boy received $\frac{1}{6}$, but the man was paid at double the rate the boy was, in proportion to the amount of work each did. How long would the man unassisted have taken to accomplish the job.

(5) How much water must be added to a mixture of 15 gal. of vinegar costing 52c. per gal. and 13 gal. costing 40c. per gal. that \$5 may be gained by selling the whole at 15c. per qt.?

(6) A total of 250 marks is to be allowed to a paper of 10 questions. To the first 7 questions the average is given. Divide the remaining marks so as to allow 7 marks to the tenth question and 5 marks to the ninth for every 3 marks allowed to the eighth.

(7) A bookseller charges on certain books 35c. on the shilling of the published price and gives a discount of 35%. What is the actual rate he charges on the shilling?

(8) A bill for \$253.03, dated 7th October, and payable at London in 3 mo. from date, was discounted in Toronto on 20th October, the discount being at the rate of 9% per annum and 45c. being charged for exchange. Find the proceeds of the bill.

(9) A cubic foot of water weighs 62·426 lb. and a gallon of water weighs 10 lb. How many gallons will a cylindrical cistern of 5 ft. diameter by 4 ft. deep hold?

June, 1887.

(1) Prove the rule for the multiplication of two fractions.

Simplify $$\frac{(7\frac{1}{4} - 3\frac{1}{2}) \times \{4\frac{1}{5} - (2\frac{1}{3} - 1\frac{7}{10})\}}{(7\frac{1}{4} + 3\frac{1}{2}) \div (1\frac{1}{2} - 9\frac{1}{2} \times \frac{9}{77})}$$

(2) *A*, *B*, *C*, rent a pasture for $92; *A* puts in 6 horses for 8 wk., *B* 12 oxen for 10 wk., *C* 50 cows for 12 wk. If 5 cows are reckoned as 3 oxen, and 4 oxen as 3 horses, what shall each pay?

(3) *A* does a work in 10 dy., *B* in 9 dy., *C* in 12 dy.; all begin together, but *A* leaves in $3\frac{3}{5}$ dy. before the completion, *B* in $2\frac{3}{5}$ before the completion. In what time was the work done?

(4) Prove the rule for division of decimals. Divide to 6 decimal places, ·0078539 by ·9921461.

(5) On March 23rd a bank gives me $845 for a note of $860. When is the note due, interest 8%?

(6) Find the cost, in sterling, of 184 tons 17 cwt. 3 qr. 14 lb. of copper, invoiced to a Toronto importer at £87 17*s*. 11*d*. per ton? (qr. = 28 lb.)

(7) I bought certain 4% stock at 75, and after a number of years sold out at 95, and found that I had made $7\frac{1}{2}$% per annum simple interest. How long did I hold the stock?

(8) There is a mixture of vinegar and water in the proportion of 93 parts vinegar to 7 parts water; how much water must be added so that in 25 parts of the mixture there may be 2 parts water?

(9) I invested $10,000, but sold out at 20% discount. How much must I borrow at 4% so that by investing all at 8% I may just retrieve my loss?

(10) A square field containing $27\frac{1}{2}$ acres has a diagonal path across it. What is the length of the path in yards?

(11) When the temperature of a cube of zinc is raised from 32°F. to 212°F. each dimension is thereby increased ·3%. Find the percentage of increase in the bulk.

(12) Water is flowing at the rate of 10 mi. per hour through a pipe 14 in. in diameter, into a rectangular reservoir 187 yd. by 96 yd. In what time will the surface be raised 1 in.?

June, 1888.

(1) Simplify

$$(a)\ \frac{\frac{3}{4}\text{ of }\frac{7}{9}\text{ of }\frac{15}{28} - 2\frac{1}{4}\text{ of }3\frac{2}{3}\text{ of }\frac{1}{72}}{4\frac{1}{2} - (3\frac{1}{3} + 4\frac{2}{7}) + 3\frac{7}{8} + \frac{3}{56}}$$

(*b*) What fraction of 365$\frac{1}{4}$ dy. is 349 dy. 8 hr. 52 min. $\frac{10}{23}$ sec.?

(2) *A* can do a work in $\frac{1}{2}$ the time that *B* requires, *B* can do it in $\frac{2}{3}$ of the time that *C* takes. All working together do it in 18 dy. How long would it take each one separately?

(3) A man got a 90 days' note for $1,360 for a lot which cost him $1,200 cash just a year before. Money 6%; find his net gain at the time of sale. (Bank discount; 360 dy. to a year; no days of grace.)

(4) Bought 78 ac. 3 rods 15 per. 7 yd. 1 ft. 9 in. of land at $80 per ac.; sold $\frac{2}{5}$ of it at $120 per ac., and the rest at $·005 per sq. ft. Find gain.

(5) A number of men and women earned $93 per day, each man getting $2.25 and each woman $1.50. Had there been 6 more men and 7 more women the whole number of women would have earned the same as the whole number of men. Find the actual number of each.

(6) A commission merchant receives 125 barrels of flour from *A*, 150 barrels from *B*, 225 barrels from *C*; he finds on inspection that *A*'s is 10% better than *B*'s, and *C*'s is 5$\frac{5}{11}$% better than *A*'s. He sells the whole lot at $7 per barrel, charging 4% commission. What sum must he remit to each?

(7) A compound of tin and lead weighs 10·43 times as much as an equal bulk of water, while tin weighs 7·44 times, and lead 11·35 times, as much as equal bulks of water. Find the number of pounds of each metal in 765 lb. of the compound.

(8) A bankrupt had goods worth $7.950. which, if sold at their full value, would give his creditors 81$\frac{1}{4}$% of their claims. But $\frac{3}{5}$ of them were sold at 17$\frac{1}{2}$% below their value, and the remainder at 23$\frac{3}{4}$% below their value. How many cents on the dollar did his creditors realize?

(9) *A* begins business with a capital of $3,200; after 3 mo. *B* is admitted as partner with $2,400; after 3 mo. more *C* is admitted with $1,600. What fraction of the year's gain should each have?

(10) If it cost \$11.20 for paper for a room 25 ft. 3 in. long, 19 ft. 9 in. wide, and 12 ft. high, when the paper is $\frac{3}{4}$ yd. wide, find cost of the paper per linear yard. (No allowance for doors and windows.)

(11) What is the cost of polishing a cylindrical marble pillar, 2 ft. 6 in. in diameter and 12 ft. long, at \$1.25 per sq. ft.?

(12) A square field, containing 16 ac. 401 sq. yd., has a walk around it outside 12 ft. in width. Find the area of the walk in yards.

June, 1889.

(1) (*a*) Simplify $\frac{\cdot 5 \times \cdot 006}{\frac{9}{15} \text{ of } \frac{4}{5} \times (\frac{1}{4})^2} \times \frac{\frac{1}{5} \text{ of } \frac{15}{16} \times (\frac{2}{3})^2}{1\cdot 6 \times \cdot 627}$ (Answer in fractional form.)

(*b*) Find the average, correct to 4 places of decimals, of $12\frac{14}{25}$, 21, $7\frac{3}{4}$, ·034, 3·125, 0, 24·58 and $12\frac{9}{20}$.

NOTE.—No marks will be allowed for either (*a*) or (*b*) except the answer be perfectly correct.

(2) In what time will \$30,441 gain \$2,210.10 if, at the same rate, the gain on \$24,944.10 for 1 yr. and 15 dy. is \$2,596.92? What is the rate per cent. per annum (365 days to a year)?

(3) A house that cost \$15,500 rents for \$155 per month. It is insured for \$10,850 at $\frac{4}{5}\%$ yearly; the taxes are 15 mills on an assessment of \$12,450, and \$346.45 is spent each year on repairs. What rate of interest does the investment pay?

(4) A rectangular field, whose width is $\frac{3}{4}$ of its length, contains 15 ac. 125 per. In going from one corner to the opposite how much shorter is it to take the diagonal than to go around the two sides?

(5) A note of \$2,450, dated Halifax, June 1, 1886, for 4 mo., bearing interest at 6%, is discounted at a bank on Aug. 15th at 8%. Find the proceeds.

(6) A farm cost $3\frac{3}{4}$ times as much as a house; by selling the house at 10% *loss* and the farm at $7\frac{1}{7}\%$ *gain*, \$3,993.30 is received. Find cost of each.

(7) Bought 64 yd. of cloth at \$5.70 per yd. If it shrank 5% in length, find the selling price per yard to gain 20%.

(8) *A* and *B* are partners, *A*'s capital being $\frac{3}{5}$ of *B*'s. At the end of 5 mo. *A* withdraws $\frac{1}{4}$ of his capital, and at the end of 9 mo. *B* withdraws $\frac{1}{3}$ of his. How should they divide a gain of \$4,222.33 at the end of the year?

(9) A man sold his 5 per cents at 78 and invested the proceeds in 6 per cents at 104. His change in income being $385, find how much 5% stock he had.

(10) A dealer shipped 400 bush. wheat at $1.40, 800 bush. at $1.62½, and 300 bush. at $1.20, to his agent, who sold the first at 20% gain, the second at 15% gain, and the third at 4⅙% loss. The agent's commission was 3%, and other charges were $83.44; find the dealer's gain per cent.

(11) What is the cost of boards, at $1 for 50 sq. ft., to make a closed box 7 ft. 10 in. long, 3 ft. 8 in. wide, 2 ft. 6 in. high (outside dimensions), the boards being 1 in. thick?

(12) Reckoning a pint to be 30 cub. in.: if 462 gal. are taken out of a cylindrical cistern 7 ft. in diameter, how many inches will the surface of the water be lowered? ($\pi = 3\frac{1}{7}$.)

June, 1890.

(1) (*a*) Show how to find the L.C.M. of two or more numbers.
(*b*) Find the L.C.M. of 24, 105, 180, 96, 336, 84, and of
(*c*) 4,410, 7,350, 7,875.

(2) (*a*) Prove the rule for finding the product of two fractions.
(*b*) Simplify $\frac{4}{5}(3\frac{1}{3} + 1\frac{1}{4})$ £

$$+\frac{1\frac{1}{8} - \frac{1}{3} \text{ of } 1\frac{5}{6}}{\frac{1}{10} \text{ of } 3\cdot\dot{3} + \frac{13}{72}} \text{ of } \cdot95 \text{ of } 5s. + \frac{8\cdot4}{\cdot012}d.$$

(3) If the Avoirdupois pound is equal to 7,000 grains Troy. and if 6,144 sovereigns weigh 133 lb. 4 oz. Troy, how many sovereigns will weigh an ounce Avoirdupois?

(4) A man engages a sufficient number of men to do a piece of work in 84 dy., if each man does an average day's work. It turns out that three of the men do respectively $\frac{1}{6}$, $\frac{1}{7}$, and $\frac{1}{9}$ less than an average day's work, and two others $\frac{1}{8}$ and $\frac{1}{10}$ more; and in order to complete the work in the 84 dy., he procures the help of 17 additional men for the 84th day. How much less or more than an average day's work on the part of these 17 men is required?

(5) How many bricks, 9 in. long, 4½ in. broad and 4 in. thick, will be required to build a wall 45 ft. long, 17 ft. high and 4 ft. thick, supposing the mortar to increase the volume of each brick 6¼%?

(6) A circular race-course is 22 yd. wide and has an area of 12 ac. Find the diameter of the inner circle.

(7) The area of each of the longer walls of a room is 330 sq. ft.; the area of each of the other walls is 220 sq. ft.; the area of the floor is 384 sq. ft. Allowing $\frac{1}{25}$ of area of walls for doors and windows, how many yards of paper, 18 in. wide, are required to cover the walls?

(8) The pressure of compressed air varies inversely as its volume. If the pressure on the inner surface of a cylinder fitted with a piston be 20 lb. on the square inch, and when the piston is forced in 2 in., the pressure becomes 30 lb. on the square inch; what is the length of the cylinder?

(9) A man has $20,000 Bank Stock which is at 170 and pays a half-yearly dividend of 5%; he sells out and invests in Stocks at 108, which pay $3\frac{1}{2}$% half-yearly. Find the change in his half-yearly income.

(10) Bought goods at $5.70 on 4 months' credit and sold them immediately at $6.12 on such a term of credit as made my immediate gain $6\frac{2}{3}$%. Reckoning interest at 4% per annum, how long credit did I give?

(11) A merchant in Montreal drew on Hamburg for 10,000 guilders at $·415; how much more would he have received if he had ordered remittance through London to Montreal, exchange at Hamburg on London being $11\frac{1}{4}$ guilders for £1, and at London on Montreal $9\frac{1}{4}$%, brokerage being $1\frac{1}{4}$% for remittance from London?

(12) (*a*) What is meant by averaging accounts?

(*b*) Find the equated time for the payment of the following accounts:—

JOHN SMITH.

1888.	*Dr.*	
June 10.—	To Mdse. at 30 days	$950
July 15.—	" " 45 "	300
Aug. 20.—	" " 60 "	250
Sept. 1.—	" " 30 "	150

1888.	*Cr.*	
July 10.—	By cash	$450
Aug. 15.—	"	350
Sept. 5.—	"	200

June, 1891.

(1) (*a*) Show that $\cdot\dot{0}4\dot{5} = \frac{5}{111}$.

(*b*) Show that $\cdot 4\dot{1}\dot{2} = \frac{68}{165}$.

(*c*) Add, without reducing to vulgar fractions, ·312, 9·4 and $\cdot\dot{2}\dot{3}$.

(*d*) Make a drawing that will show the number of square yards in a square rod.

(2) Find the premium paid to insure a house worth $7,500 for $\frac{2}{3}$ of its value for 3 yr., the rate being $\frac{3}{5}$% of the policy for each year.

(3) A tax of $24,750 is levied on a town, the assessed valuation being 1·5 mills on the dollar; what tax does a man pay on an income of $1,100, of which $400 is exempted?

(4) From the list price of a line of goods a purchaser is allowed a trade discount of 20%; a further discount of 10% off the trade price for taking a quantity, and a still further discount of 5% off his bill for cash. Find his gain per cent. by selling it 10% less than the list price.

(5) A man invests $12,000 in 3% stock at 75; he sells out at 80, and invests $\frac{1}{3}$ of the proceeds in $3\frac{1}{2}$% stock at 96, and the remainder at 5% par. Find the change in his income.

(6) A man puts $350 in a Saving's Bank each year, making his first deposit December 31, 1890. How much will there be to his credit January 1, 1895, the Bank adding 4% per annum?

(7) *A* owes *B* $400 due in 1 yr., $300 due in 2 yr., $200 due in 3 yr. What sum paid now would cancel the debt, money being worth 5% per annum, compound interest?

(8) The sides of a triangle are 13, 14 and 15 ft.; find its area, and the length of the three perpendiculars from the angles on the opposite sides.

(9) The external dimensions of a rectangular covered box, made of inch stuff, are 7, 8 and 9 ft.; find the capacity of the box, and the quantity of lumber in it.

(10) A well 7 ft. in diameter and 28 ft. deep, is to have a lining of special bricks, fitting close together without mortar, 7 in. thick; find, in tons, the weight of the bricks, supposing 1 cub. in. of brick to weigh $\frac{2}{3}$ of an ounce, and 1 cwt. = 112 lb. ($\pi = \frac{22}{7}$.)

(11) *A* shipped to *B* 1,000 sheep, the buying price of which was $4.50. *B* pays a freight charge of 17½c. per head, and the cost of feed and yard is 2¼c. each per day. His first sale is made at the end of 2 dy., which consists of a lot of 250 head at $5.25. At the end of the third day he sells a second lot of 525 at $6, and at the same time 5 sheep are killed by an accident. The balance are disposed of at $5 per head at the end of the fifth day. *B* takes 10% of the profits for his commission, and remits the balance to *A*. Make out *B*'s Account Sale to *A*.

(12) *A* has 8 bottles and *B* 2 bottles of wine. At odd times a common friend, *C*, joins them, and the three share equally. To recoup *A* and *B*, *C* hands over $10. How should *A* and *B* settle between them?

(13) Add vertically and horizontally the following statement:—

							Tot'l
	$1169 84	$3650 12	$189 10	$97 22	$26 55	$851 02	
	909 58	866 78	914 19	239 49	297 02	312 60	
	575 72	742 49	1654 70	196 17	859 69	1477 42	
	2678 28	1180 66	119 25	8418 60	2223 42	568 35	
	312 83	1638 24	2016 72	1542 24	5300 20	116 02	
	1052 47	342 65	108 00	349 95	136 97	1214 03	
	339 11	687 23	215 17	1020 00	1124 50	1732 25	
	1732 50	514 02	557 60	600 00	475 00	138 50	
	1237 50	3839 25	777 60	136 70	4656 65	1097 47	
	113 56	1291 98	112 50	1850 14	738 75	1204 74	
	3661 00	973 03	311 20	636 99	243 44	142 91	
	1139 67	670 22	1201 64	7357 51	252 47	694 62	
Tot'l							

June, 1892.

(1) (*a*) Define and give examples of *quantity, unit, concrete number, abstract number.*

(*b*) When can concrete numbers be added, multiplied and divided?

(*c*) Explain the basis of our system of numeration.

(*d*) Show that a square number never ends in 2, 3, 7 or 8.

(2) (*a*) Find the value of

$$\frac{1}{10^2} \times \left\{ 1 - \frac{3}{1} \cdot \frac{1}{10^2} + \frac{3 \cdot 4}{1 \cdot 2} \cdot \frac{1}{10^4} - \frac{3 \cdot 4 \cdot 5}{1 \cdot 2 \cdot 3} \cdot \frac{1}{10^6} + \frac{3 \cdot 4 \cdot 5 \cdot 6}{1 \cdot 2 \cdot 3 \cdot 4} \cdot \frac{1}{10^8} \right\}$$

to 8 places of decimals.

(*b*) Express as the product of powers of prime factors:—

$$\frac{11.\ 12.\ 13.\ 14.\ 15.\ \ldots\ldots\ldots\ 38.\ 39.\ 40.}{1^3.\ 2^3.\ 3^3.\ \ldots\ 8^3.\ 9^3.\ 10^3.}$$

(3) A regiment of 1,000 men, 4 abreast, and marching 3 ft. apart, passes over a bridge 3 mi. 44 yd. long in 56 min. 10 sec. If each man takes 96 steps per minute, determine the length of each step.

(4) A dealer shipped 200 barrels of apples to Liverpool; the average cost of the apples was $3.75 per barrel; for what sum must he have the apples insured at ¾% premium to guard against all loss, in case of shipwreck, his other expenses being $75?

(5) *A* and *B* are two railway companies that pay respectively 4½% and 1⅜% per annum on their $100 shares. When the price of a share in *A* is 101¼ and in *B* 32¼, what is the amount of money which, when invested in one rather than in the other, would give rise to a difference of income of $31.50?

(6) On January 1, 1890, a person borrowed $2,417.50 at 6¾% simple interest, promising to return it as soon as it amounted to $2,582.50. On what day did the loan expire? (365 dy. = 1 yr.)

(7) Distinguish between *simple* and *compound interest*, and between *interest* and *discount.*

A teacher's salary of $1,000 is paid in four quarterly payments at the end of each quarter. What sum at the beginning of the year is equivalent to these payments, reckoning compound interest at 2% per quarter?

(8) A Canadian tourist goes to Paris with $5,000, which he exchanges for French money at the rate of 19⅕c. for one *franc.* He spends 830 francs in France and thence goes to Vienna where he exchanges what he has left at the rate of 135 *florins* for 300 francs. He spends 500 florins at Vienna, and then goes to England where he exchanges his money, getting 1*s.* 8*d.* for a florin. His outlay in England is £75 10*s.* How much Canadian money has he left if £1 = $4.80?

(9) (*a*) The sides of a triangle are 25, 39, 56 ft. respectively. Find its area.

(*b*) A road runs round a circular pond; the outer circumference is 280 ft., and the inner 210 ft. Find the breadth and area of the road. ($\pi = 3{\cdot}14159$.)

(10) (*a*) The surface of a sphere is equal to one-half of that of a right circular cone; the radius of the base of the cone is 1 ft. and its height $\sqrt{3}$ ft. Find the volume of the sphere.

(*b*) Two wheels of a carriage are 3 ft. 9 in. and 4 ft. 8 in. respectively in diameter. How far will the carriage have gone when one wheel has gained 12 revolutions on the other?

ANSWERS.

I.—Review Problems.

(1) 45. (2) 223 bush. 1 pt. 1 gal. (3) 4 mi. (4) 26 lb.; $20\frac{2}{13}$c.
(5) $6.88. (6) $11; $15; $8. (7) 60c.; 85c.
(8) $32.20; $\$48\frac{26}{32}$. (9) 27. (10) 6.
(11) 57 ac. 3 roods 17 sq. rods. 4 sq. yd. 2 sq. ft. $128\frac{4}{7}$ sq. in.
(12) 70 mi. 104 rods, 1 ft. 6 in. (13) 12 ft. 6 in.
(14) $3.20; $6.80; $8. (15) $163\frac{7}{8}$ nearly.
(16) $4.37. (17) $33.60. (18) 9,000.
(19) $17.50 nearly. (20) $26.65. (21) $2\frac{1}{2}$. (22) $53.46.
(23) $38.19 balance. (24) 250. (25) 18. (26) $18; $175.
(27) $109.10. (28) 40 yd.; 10 yd.
(29) 24; $57.60. (30) 80. (31) 800.
(32) 11 hr.; $12\frac{1}{2}$ hr. (33) 23 ac. 60 sq. rods, 25 sq. yd.
(34) $\$147.69\frac{3}{5}$. (35) 360. (36) 15. (37) 208.
(38) $814\frac{1}{5}$. (39) $12.38.
(40) 84 mi. 1 fur. 29 rods, 2 yd. 2 ft. 2 in.
(41) $214.56; $361.44. (42) $2\frac{7}{8}$. (43) $1,080.
(44) ———. (45) ———. (46) 72c.
(47) *C*'s is worth $\$5.06\frac{2}{3}$. (48) $2,203,200. (49) ——.
(50) 108 sq. in.; 72 cub. in. (51) $92\frac{1}{3}$c.
(52) 12c. or 16c., according to the number of ounces in a pound:
20c.; $534. (53) Balance $4.70.
(54) 43 ac. 110 sq. rods, 6 sq. ft. (55) $7\frac{1}{2}$. (56) $22\frac{1}{2}$.
(57) $109\frac{1}{2}$ + days. (58) $96.40.
(59) 103 sq. rods, 22 sq. yd. 8 sq. ft. 16 sq. in. (60) 1,450.
(61) $76.80. (62) $26.24; $315. (63) 2,100.
(64) 6 ac. 68 sq. rods, 17 sq. yd. 2 sq. ft. $82\frac{2}{7}$ sq. in.
(65) $7.70 nearly. (66) $17.08 left. (67) $38.28.
(68) 2, 3, 3, 3, 5, 7; 720. (69) 8,320; $99.84.
(70) 12 mi. 300 sq. rods, 1 ft. (71) $9. (72) 396. (73) 5.

(74) 2 tons, 6 cwt. $11\frac{1}{4}$ lb.
(75) 10,185 ac. 107 sq. rods, 8 sq. yd. 6 sq. ft. 20 sq. in.
(76) 105 qt. (77) ———. (78) 2,400. (79) 132.
(80) $24. (81) 35c. (82) $37.99; $36\frac{520}{827}$c.
(83) 208. (84) $104\frac{26}{31}$. (85) $173,888.
(86) $\$33.48\frac{2}{27}$. (87) 17; 960.
(88) 114 ac. 45 sq. rods, 21 sq. yd. 5 sq. ft. $66\frac{6}{7}$ sq. in.
(89) 664. (90) $15,400. (91) $170.87.
(92) 1 mi. 7 fur. 4 rods, 4 yd. 1 ft. (93) 5.
(94) Midway at 3 p.m. (95) $34.85. (96) $\$88.28\frac{3}{4}$.
(97) $3\frac{229}{264}$. (98) 18. (99) 18c. (100) 22.
(101) $44.20. (102) $89.60. (103) $108. (104) 225.
(105) 5. (106) $14.88. (107) $82.50; $56.10; $26.40.
(108) $13\frac{1}{3}$. (109) $12\frac{1}{2}$. (110) $\$7,333\frac{1}{3}$.
(111) 2, 2, 3, 1,579. (112) $3.24.
(113) 257,385,843. (114) $\$7.55\frac{3}{8}$. (115) 9 ft.
(116) *A* $600; *B* $540; *C* $660. (117) ———.
(118) $3,203\frac{4}{15}$ min. (119) $\frac{14881}{87120}$. (120) $131.25.
(121) 12. (122) 4 hr. 46 min. 16 sec. (123) 20 mi.
(124) 6,019,200. (125) $66.
(126) $1\frac{1}{2}$ lb. green; $3\frac{1}{2}$ lb. black. (127) 109 ft. (128) $71.28.
(129) 140. (130) 9. (131) 21,912. (132) $76\frac{1}{2}$ lb.
(133) 56; 398; 476; 36. (134) $150. (135) 3 hr.
(136) 69 lb.; 225 doz. (137) $42. (138) 32.
(139) $19\frac{1}{4}$ mo. (140) 3 more. (141) $6.43.
(142) 6 ac. 3 roods, 31 sq. rods, $23\frac{3}{4}$ sq. yd.
(143) 768 mi. 6 fur. 27 rods, 4 yd. 0 ft. 6 in. (144) 296.
(145) $57.60. (146) 204 bags; 77 lb. left. (147) 9.
(148) 259. (149) 4 hr. (150) $7\frac{1}{2}$ doz. (151) $15.68.
(152) $1,472\frac{8}{11}$ mi. (153) $57. (154) $1\frac{9}{11}$ ac. (155) 40,960.
(156) 24. (157) $32; $36; $40. (158) $24.
(159) $175.30. (160) $15.19. (161) $26.10. (162) $47.80.
(163) 2; 8,400. (164) 2,604 lb.; $10.85. (165) $1.86.
(166) $6.79. (167) $62\frac{1}{4}$ cords. (168) 2,450. (169) $14.85.
(170) $6\frac{2}{3}$ lb. (171) $62.50. (172) The $19 coat.
(173) $72; $33. (174) $\frac{1}{3}$ of the whole.
(175) 9 dy. (176) $\$\frac{15}{28}$. (177) $15\frac{3}{4}$. (178) $13\frac{1}{2}$ ft.
(179) $4\frac{1}{2}$. (180) 21. (181) 24c.; 48c.; $2.
(182) 3 in. (183) $11\frac{1}{12}$ yd. (184) $61\frac{1}{2}$. (185) $\frac{1}{12}$.
(186) $6.50. (187) $18. (188) ———. (189) $4\frac{37}{216}$.
(190) $\frac{1}{18}$; $\frac{1}{9}$. (191) $31.25. (192) 20 yd. (193) $26,580.
(194) $231. (195) $91.
(196) 11 ton, 5 cwt. 1 qr. 0 lb. 7 oz. (197) 605 min.
(198) $700. (199) 28,462. (200) $242\frac{6200}{8098}$.

II.—ADDITION OF FRACTIONS

(1) $6\frac{7}{16}$. (2) $103\frac{13}{15}$. (3) \$$95\frac{21}{40}$. (4) \$$623\frac{1}{56}$.
(5) \$$189\frac{1}{12}$. (6) $25\frac{23}{40}$. (7) $52\frac{4}{9}$. (8) $20\frac{17}{20}$.
(9) $1,426\frac{33}{50}$. (10) $\frac{7}{36}$. (11) $23\frac{14}{15}$. (12) $17\frac{1}{20}$.
(13) $96\frac{29}{90}$. (14) $64\frac{232}{2625}$. (15) \$$1\frac{1}{4}$. (16) $18\frac{3}{8}$.
(17) 331. (18) $37\frac{1}{2}$. (19) \$$7\frac{1}{8}$. (20) $133\frac{3}{4}$.
(21) $102\frac{1}{6}$. (22) $267\frac{2}{3}$. (23) The whole. (24) $197\frac{5}{24}$.
(25) $31\frac{15}{16}$. (26) $68\frac{2}{21}$. (27) $16\frac{7}{8}$; \$$67\frac{1}{40}$.
(28) \$$17\frac{29}{120}$. (29) $767\frac{2}{7}$; \$$703\frac{1}{3}$. (30) $387\frac{59}{360}$

III.—SUBTRACTION OF FRACTIONS.

(1) $10\frac{17}{66}$. (2) $33\frac{1}{15}$. (3) $100\frac{17}{18}$. (4) $36\frac{1}{2}$.
(5) $536\frac{1}{4}$. (6) $521\frac{11}{12}$. (7) $88\frac{1}{6}$. (8) \$3.
(9) $189\frac{1}{2}$. (10) \$$19\frac{2}{5}$. (11) $47\frac{1}{2}$. (12) $21\frac{3}{4}$.
(13) $722\frac{5}{21}$. (14) $3\frac{3}{4}$. (15) \$$3\frac{1}{4}$. (16) $3\frac{1}{12}$.
(17) $9\frac{2}{3}$. (18) $2\frac{17}{24}$. (19) $4\frac{25}{36}$. (20) $178\frac{3}{8}$.
(21) \$$114\frac{1}{48}$. (22) $35\frac{1}{4}$. (23) \$$4\frac{11}{12}$. (24) $136\frac{2}{5}$.
(25) $4\frac{29}{65}$. (26) $87\frac{1}{2}$. (27) $\frac{31}{60}$. (28) $\frac{159}{456}$.
(29) $\frac{379}{3360}$. (30) $20\frac{39}{56}$.

IV.—MULTIPLICATION OF FRACTIONS.

(1) $30\frac{4}{5}$. (2) \$$3\frac{5}{6}$. (3) 16. (4) \$60.
(5) \$$\frac{1}{4}$. (6) \$2. (7) \$$6\frac{2}{3}$. (8) $42\frac{5}{8}$ mi.
(9) $\frac{2}{5}$. (10) \$$8\frac{1}{4}$. (11) $34\frac{3}{8}$. (12) $1\frac{11}{12}$.
(13) \$90. (14) \$25. (15) 2. (16) \$$\frac{7}{44}$.
(17) \$$5.46\frac{5}{6}$. (18) \$$1\frac{31}{64}$. (19) \$1,295. (20) $6\frac{2}{3}$.
(21) $60\frac{3}{7}$. (22) $\frac{3}{7}$. (23) $534\frac{3}{8}$. (24) \$81.
(25) $3,666\frac{2}{3}$. (26) 8,624. (27) $103\frac{1}{8}$. (28) $50\frac{24}{25}$.
(29) \$$4\frac{15}{16}$. (30) 324.

V.—DIVISION OF FRACTIONS.

(1) $6\frac{1}{2}$. (2) $3\frac{5}{6}$. (3) $11\frac{1}{3}$. (4) $26\frac{2}{3}$.
(5) $15\frac{1}{2}$. (6) $3\frac{3}{8}$. (7) $26\frac{1}{4}$. (8) $93\frac{22}{51}$.
(9) 46. (10) $7\frac{7}{8}$. (11) $8\frac{8}{27}$. (12) $1\frac{2}{5}$.
(13) $13\frac{19}{25}$. (14) $\frac{5}{14}$. (15) $1,689\frac{3}{5}$. (16) 4.
(17) $5\frac{35}{48}$. (18) $9\frac{1}{3}$. (19) $\frac{1}{2}$. (20) 27.
(21) $9\frac{1}{3}$. (22) $3\frac{3}{20}$. (23) \$$3\frac{219}{427}$. (24) $72\frac{8}{111}$.
(25) 66. (26) \$$988\frac{1}{3}$. (27) $429\frac{1}{3}$. (28) $70\frac{11}{54}$.
(29) \$$3,740\frac{3}{4}$. (30) \$$190\frac{10}{21}$.

VI.—Promiscuous Examples in Fractions.

(1) $\frac{5}{9}$; $\frac{110}{253}$; $\frac{5}{6}$; $\frac{2}{3}$; $\frac{11}{12}$. (2) $236\frac{7}{25}$; $2,195\frac{12}{13}$; 45; 385.
(3) $\frac{2301}{14}$; $\frac{2909}{61}$; $\frac{11657}{112}$. (4) $\frac{525}{25}$; $\frac{1700}{50}$; $\frac{1350}{18}$.
(5) $\frac{15}{40}$; $\frac{24}{40}$; $\frac{65}{40}$. (6) $10\frac{5}{8}$. (7) $4\frac{8}{15}$. (8) $\frac{3}{14}$.
(9) $\frac{7}{121}$. (10) 144. (11) W. \$$1\frac{2}{3}$ more. (12) $47\frac{1}{2}$.
(13) $8\frac{7}{24}$. (14) \$$4\frac{1}{2}$. (15) \$4,200. (16) \$$6\frac{3}{4}$.
(17) \$71.30. (18) $2\frac{1}{2}$. (19) $64\frac{1}{16}$c. (20) $6\frac{4}{9}$.
(21) \$·$17\frac{24}{83}$. (22) $37\frac{1}{5}$. (23) \$$925\frac{74}{105}$ gain.
(24) $163\frac{7}{20}$. (25) $2,066\frac{11}{14}$. (26) $153\frac{1}{3}$.
(27) $9\frac{5}{13}$. (28) \$2,850 son; \$$2,533\frac{1}{3}$ daughter.
(29) \$$89\frac{5}{7}$. (30) 16. (31) $2\frac{23}{50}$. (32) 6.
(33) $16\frac{2}{3}$. (34) 28. (35) 15. (36) $\frac{5}{12}$ left, worth \$375.
(37) \$10,000. (38) $\frac{4}{9}$. (39) $\frac{11}{23}$. (40) $\frac{1007}{2664}$. (41) $\frac{3}{16}$.
(42) $\frac{59}{240}$. (43) 8,468. (44) $\frac{2}{9}$. (45) $\frac{48}{103}$; $\frac{55}{103}$.
(46) \$1,600. (47) \$$1,356\frac{2}{3}$. (48) $6\frac{1}{4}$. (49) $19\frac{1}{3}$.
(50) $3\frac{120554}{143325}$. (51) $8\frac{88}{175}$. (52) $\frac{108}{245}$. (53) $25\frac{65}{173}$.
(54) 1,125. (55) 49,200. (56) $86\frac{1}{16}$. (57) $\frac{5}{24}$. (58) $6\frac{6}{19}$.
(59) $3\frac{109}{162}$. (60) $671\frac{11}{32}$. (61) $1\frac{1}{5}$. (62) $26\frac{2}{3}$. (63) $\frac{6509}{22777}$.
(64) $2\frac{214}{7250}$. (65) $11\frac{1}{4}$. (66) $10\frac{4}{5}$. (67) 36. (68) $\frac{11}{14}$.
(69) 222. (70) \$$6\frac{152}{285}$. (71) $\frac{1}{4}$.
(72) $\frac{5}{21}$; \$$4,263\frac{1}{3}$; $\frac{10}{21}$; $8,726\frac{2}{3}$. (73) \$105. (74) \$$3\frac{37}{56}$.
(75) $12\frac{19}{27}$. (76) \$$11,354\frac{2}{3}$. (77) \$$15,986\frac{1}{4}$.
(78) \$$24\frac{29}{107}$; \$$28\frac{78}{107}$. (79) \$2,600; \$3,900.
(80) \$$5,797\frac{1}{2}$. (81) $4\frac{4}{9}$. (82) $3\frac{1}{13}$. (83) 30. (84) 40; 84.
(85) \$43. (86) $26\frac{8}{17}$. (87) 45; 30. (88) $8.269\frac{1}{2}$.
(89) \$2,700; \$3,000. (90) \$48. (91) 28; 21.
(92) $2,691\frac{13}{17}$. (93) \$$3,733\frac{1}{3}$. (94) \$4,200.
(95) \$35; \$52.50. (96) $\frac{51}{320}$. (97) \$4,500.
(98) 1,520. (99) \$3,140. (100) $4\frac{4}{5}$.

VII.—Introductory.—No answers.

VIII.—Addition of Decimals.

(1-9) Self Testing. (10) 427·002 cwt. (11) 238·6174 mi.
(12) 331·98 yd.

IX.—Subtraction of Decimals.

(1) 73843·77444. (2) 9382·3623. (3) 342·3709.
(4) 6530·93705. (5) 894·2017. (6) 321·99979.
(7) 9563·704 sq. yd. (8) 11·631 tons. (9) 3·37079 in.
(10) 15·15 ft. (11) ·13; ·9148.

X.—MULTIPLICATION OF DECIMALS.

(1) ·00004887. (2) 72·04672536. (3) ·00005265.
(4) 3·3288. (5) ·22539. (6) 84041·6032.
(7) 781796·101. (8) 35·280686. (9) 31539·3078.
(10) 97·958425. (11) 32·25 yr.; 26·875 yr.
(12) 452·99 sq. yd. (13) ·0049056 sq. mi. (14) $281·173.
(15) Lose $2·8994.

XI.—DIVISION OF DECIMALS.

(1) ·0023. (2) ·000625. (3) 88·99. (4) 4·321.
(5) 4·444. (6) ·6070809. (7) 96·876543. (8) 111·11.
(9) 12·034. (10) 9·0009. (11) 16·35 yd. (12) 27·16 yd.
(13) $·878 per cwt.; $·00878 per pound.
(14) $3·2448 +. (15) 38·905.

XII.—REDUCTION OF DECIMALS.

(1) 542·4362. (2) 121·215 mi. (3) 204·73125 lb.
(4) 3·34375 rods. (5) 1979·9428 ac. (6) 1·017875; ·001.
(7) 9·099125; 1·54726246. (8) ·0166375.
(9) $1306.66⅔; $1650. (10) 14·3636. (11) 990·8125 lb.

XIII.—PROMISCUOUS EXAMPLES IN DECIMALS.

(1) 54·39 yd. (2) 19·656 ft. (3) 53·0499 +. (4) ·1.
(5) $46·875. (6) ·0144. (7) 720·03. (8) 15·156.
(9) 1035·2254 +. (10) 97½ yd.; 13 widths. (11) ·028 +.
(12) 5408·4 lb. (13) 200·15625. (14) 24469·25763 oz.
(15) 0. (16) $5¼. (17) $1,000. (18) $1,000.
(19) $·84375. (20) $3·080625. (21) $2.25.
(22) 11·1926 + hr. (23) 13·19472 yd. (24) 523·6 yd.
(25) 23·562 in.; 287·4564 in. (26) 1210·1184 lb. (27) ·00001.
(28) 0. (29) $219·5178. (30) $49684.03.

THE METRIC SYSTEM.

XIV.—Oral Exercise.—No answers.

XV.—Seat Exercise.—No answers.

XVI.—Reduction.

(3) 288·564 m. (4) 8·089 Hm. (5) 728842·7 g.
(8) 14 times. (9) 1,000 (10) 24·147 m.
(11) 932·7 m. (12) 530,120 cg. (13) 65·480625 Dl.
(14) $71.15. (15) 245·25 Km. (16) 22·231 Km.
(17) 1,642 m. (18) $5. (19) 50c. (20) $1.52.

XVII.—Square Measure.

(1) 71930·05 sq. m.; 50505·0505 sq. m. (2) 60381·53 sq. dm.
(3) 195948 ca. (4) 5893·7342 a.
(5) 2·509703 sq. m.; 35·020509 sq. m.
(6) 175190 sq. cm.; 17519000 sq. mm. (7) $·8642.
(8) 18·72 sq. m. (9) 4250. (10) 21736 sq. m.; 517·3 sq. m.
(11) 38728·47 a.; 387·2847 Ha. (12) ·1239 Ha.
(13) 128·56 Ha. (14) 9505·25 sq. m. (15) 13·202 rolls.

XVIII.—Cubic Measure.

(1) 319·099285004. (2) 196·6 s. (3) 756 ds.
(4) 29312·703 cu. dm. (5) 1219·24940201 cu. m.
(6) 11·34 cu. m. (7) $167.31. (8) 1·25 + m.

XIX.—Simple Interest.

(1) $43.75. (2) $20.25. (3) $13.53. (4) $23.80.
(5) 34·375. (6) 202.80. (7) 40·817. (8) 5·555.
(9) 62.25. (10) 433·1475. (11) 14.40. (12) 893.75.
(13) 17·325. (14) 178.02. (15) 39·655. (16) 51.
(17) 96. (18) 54.36. (19) 1,122. (20) 924.
(21) ·43. (22) 4.31. (23) 12.20. (24) 5.69.
(25) 20.41. (26) 2.94. (27) 5.55. (28) 18.27.
(29) 21.20. (30) 3.74. (41) 1 yr. (42) 4 yr.
(43) 5⅙ yr. (44) 6⅑ yr. (45) 1½ yr. (46) 3 yr. 8 mo.
(47) 16 yr. 8 mo. (48) 8 yr. 4 mo. (49) 95 dy.
(50) 300 dy. (51) 9%. (52) 5%. (53) 4½%.

(54) $4\frac{1}{6}$%. (55) 4%. (56) $3\frac{1}{3}$%. (57) $5\frac{2}{3}$%.
(58) 6%. (59) $2\frac{2}{3}$%. (60) $4\frac{4}{5}$%. (61) $1,200.
(62) $550. (63) $350. (64) $85. (65) 630.
(66) 975. (67) 840. (68) 500. (69) 127.50.
(70) 3,648. (71) 887.50. (72) 1,614.50. (73) $6,120.
(74) 5. (75) 10. (76) 5. (77) 8.
(78) 1,500. (79) 1,200. (80) 1,200.

XX.—PROMISCUOUS EXAMPLES IN INTEREST.

(1) $2\frac{1}{2}$ yr. (2) 5%. (3) $33\frac{1}{3}$ yr.; $22\frac{2}{9}$ yr.; 16 yr.
(4) $4\frac{2}{3}$%. (5) 8 yr. (6) $5,000. (7) 20%; 6%.
(8) $1,134. (9) $750. (10) Feb. 2, 1892.
(11) 9%. (12) $7\frac{1}{2}$%. (13) $3\frac{1}{2}$ yr. (14) $3,000.
(15) $300.

XXI.—TRUE DISCOUNT.

(1) $46·951. (2) $58.62 +. (3) $113.65. (4) $99·502.
(5) 32.86 +. (6) 11·473. (7) 955.26 +.

XXII.—COMPOUND INTEREST.

(1) $139.73. (2) $54.61. (3) $84.83. (4) $64.89.
(5) 364.96. (6) 1,620.83. (7) 3,802.82. (8) 29.25.
(9) 513.52. (10) 689.83.

BANK DISCOUNT AND PROMISSORY NOTES.

XXIII.—EXERCISE IN WRITING NOTES.—No answers.

XXIV.—DISCOUNTING NOTES.

(1) Aug. 24–27, $7.35, $692.65.
(2) Aug. 19–22, $1.05, $98.95.
(3) Nov. 11–14, $.88, $119.12.
(4) May 15–18, $2.87, $137.13.
(5) Oct. 10–13, $3.66, $176.34.
(6) May 1–4, $8.50, $241.50.
(7) Sept. 3–6, $2.06, $372.94.
(8) April 12–15, $9.45, $590.55.
(9) May 21–24, $31, $1,169.
(10) April 10–13, $27.59, $1,752.41.
(11) July 5–8, 1891, 84 dy., $15.39, $809.01.

(12) Nov. 20–23, 1891, 75 dy., $\$2.58$, $\$152$.
(13) Aug. 5–8, 1889, 114 dy., $\$6.16$. $\$318.04$.
(14) Jan. 1–4, 1892, 144 dy., $\$18.90$, $\$453.60$.
(15) Sept. 1–4, 1890, 132 dy., $\$17.26$, $\$767.29$.
(16) March 1–4, 1892, 75 dy., $\$14.71$, $\$867.99$.
(17) May 1–4, 1892, 108 dy., $\$44$, $\$1,422.50$.
(18) Jan. 1–4, 1890, 162 dy., $\$118.51$, $\$2,515.09$.
(19) Oct. 15–18, 1891, 156 dy., $\$144.76$, $\$3,566.99$.
(20) May 10–13, 1892, 174 dy., $\$313.39$, $\$6,170.61$.
(21) $\$1,000$. (22) $\$2,000$. (23) $\$987.09$. (24) $\$1,015.74$.
(25) $\$1,408.11$. (26) $\$1,262.29$. (27) $\$5,299.46$. (28) $\$1,937.56$.
(29) $\$507.09$. (30) $\$15,316.54$.

XXV.—PARTIAL PAYMENTS.

(1) $\$435.55$. (2) $\$402.88$. (3) $\$91.45$. (4) $\$257.20$.
(5) 479.80. (6) 439.28. (7) 4,841.52. (8) 3,986.35.
(9) 219.31. (10) 15.09.

XXVI.—TRADE DISCOUNT.

(1) $\$3·645$. (2) $\$3·1488$. (3) $\$3·173$. (4) $\$2.73$.
(5) 5·4675. (6) 2·698425. (7) 2·0244. (8) 4·02192.
(9) 1·71936. (10) 2·01285. (11) 459.27. (12) 548.
(13) 60. (14) 29.97. (15) 1.98.

XXVII.—PROFIT AND LOSS.

(1) $\$192.75$; $\$1,477.75$. (2) $\$192.75$; $\$1,112.25$.
(3) $\$417.60$. (4) $\frac{1}{4}$. (5) $\$3$; $\$15$. (6) $\$3$; $\$12$.
(7) $\$55$ (8) $\frac{1}{3}$; $33\frac{1}{3}\%$. (9) $\$10$. (10) $\$10$; $\$60$.
(11) $\$8$. (12) 60c. (13) $\$1$. (14) $\$48$. (15) $\$180$.
(16) $\$38.50$. (17) $\$343\frac{3}{4}$. (18) $\$358.40$. (19) $\$397.11\frac{1}{4}$.
(20) $\$51.75$. (21) $\$5.40$. (22) $\$96.88\frac{3}{4}$. (23) $\$6,480$.
(24) $\$1,605$. (25) $\$3,450$. (26) $\$422.15\frac{3}{8}$. (27) $\$4.80$.
(28) $33\frac{1}{3}\%$. (29) 25%. (30) $28\frac{4}{7}\%$. (31) 20%.
(32) 25%. (33) $11\frac{1}{9}\%$. (34) $12\frac{36}{97}$. (35) $2\frac{1}{2}\%$.
(36) $\$2.29\frac{1}{16}$. (37) $11\frac{1}{9}\%$. (38) $66\frac{2}{3}\%$. (39) $12\frac{32}{1339}$.
(40) For cash at once $3\frac{54}{107}\%$. (41) $42\frac{6}{7}\%$ *A*'s; $50\frac{50}{133}\%$ *B*'s.
(42) $51\frac{6}{19}\%$. (43) $\$1.50$. (44) 5 hr. (45) Nothing.
(46) 50% more. (47) $\$315,581.40$. (48) $\$300$.
(49) $\$6,000$. (50) $6\frac{1}{4}\%$. (51) $16\frac{2}{3}\%$. (52) $37\frac{1}{2}\%$.
(53) 50 sheep. (54) 900 bush. (55) 16%. (56) $\$12.50$.
(57) $42\frac{6}{7}\%$. (58) Pay cash; $1\frac{2}{51}\%$. (59) 50%.

(60) Sell now at 20c.; by \$10.48 +. (61) \$4.
(62) \$1.75. (63) \$218.50. (64) $16\frac{2}{3}$%. (65) \$20.
(66) \$2.50. (67) $\$1.06\frac{1}{4}$. (68) \$·96653. (69) $\$1.03\frac{1}{8}$.
(70) $\$2.05\frac{2}{5}$. (71) $43\frac{1}{8}$%. (72) \$4778·0153 +.
(73) $3\frac{1}{3}$%. (74) \$1,000. (75) 25%. (76) 25%.
(77) 10%. (78) $4\frac{57}{100}$% gain. (79) \$1,200.
(80) 4%. (81) $\frac{1}{5}$. (82) \$232.80 gain.
(83) $18\frac{1}{8}$%. (84) 3*s.* $8\frac{1}{4}$*d.* (85) $8\frac{9}{52}$%.

ENTRANCE EXAMINATION PAPERS.

June, 1883.

(1) Book-work; Q. 5,783; rem. 3,087.
(2) Book-work; Wt. $1,031\frac{1}{4}$ tons; \$3,300. (3) $\$29,027.84\frac{1}{3}$.
(4) $\$319.37\frac{1}{2}$. (5) $\frac{62681}{72576}$; $\frac{441}{4136}$. (6) $133\frac{1}{3}$; 100; $13\frac{1}{3}$.
(7) $\$3.56\frac{1}{9}$. (8) \$5.26 nearly. (9) ·30829.
(10) $21\frac{9}{11}$ min. after 4; $5\frac{5}{11}$ min. and $38\frac{2}{11}$ min. after 4.

December, 1883.

(1) $726386\frac{1197}{1729}$. (2) \$36.08. (3) Not so; $9\frac{8}{13}$ times.
(4) \$508; \$438; \$254. (5) 15. (6) ·001486 +.
(7) \$14.56. (8) $293\frac{1}{3}$ yd. in distance. (9) $\frac{1}{4}$. (10) \$4.81 +.

June, 1884.

(1) 7,070. (2) 149,688; 119. (3) ·00278 +. (4) $7\frac{21}{32}$; $\frac{1}{7}$.
(5) \$8.76. (6) $1\frac{3521}{31104}$. (7) $28\frac{4}{5}$; 36; 48. (8) 5,000.
(9) \$111.88. (10) \$24.04 +; \$240; 8%.

December, 1884.

(1) 80,407,089. (2) 221. (3) $\$126.80\frac{23}{24}$.
(4) (*a*) $22\frac{93}{94}$; (*b*) $\frac{26163}{2750000}$. (5) $11\frac{1}{4}$ ft. (6) 7 dy.
(7) $27\frac{5}{9}$. (8) \$19.12 nearly. (9) 24 min. and $19\frac{7}{11}$ after 4.

June, 1885.

(1) Book-work. (2) $\frac{1261}{3722}$. (3) $28{\cdot}8\dot{9}2701\dot{7}$.
(4) 93.39\frac{1}{2}$. (5) 8$\frac{1}{4}$c. (6) 43.83\frac{3}{4}$. (7) 16$\frac{2}{3}$ yr.
(8) 266\frac{2}{3}$; 933\frac{1}{3}$. (9) 16$\frac{4}{11}$ min. after 3 ; 13$\frac{11}{13}$ min. after 3.
(10) $90.

December, 1885.

(1) 2, 3, 5, 7, 11. (2) $\frac{14}{23}$; 28,152. (3) $1,890. (4) 5$\frac{1}{7}$.
(5) ·000372. (6) 323.12\frac{1}{2}$.
(7) A yard ; a day ; a sovereign. (8) $132. (9) 4 hr.

July, 1886.

(1) 1,380,505$\frac{1}{2}$; 478,969. (2) $69.08. (3) $526.70.
(4) $14 ; 30 of each. (5) $2,000 ; 8%.
(6) $424 ; $364 ; $212. (7) $\frac{1}{20}$. (8) 10$\frac{10}{21}$ yd.

December, 1886.

(1) 52 times. (2) ·0001. (3) 1$\frac{1}{4}$ mi. (4) $37.50.
(5) 30 cows. (6) 5 yr. (7) $1.27. (8) 12$\frac{1}{2}$ yr.
(9) $9.90. (10) A number is exactly divisible by 9 if the sum of its digits is divisible by 9 without a remainder.
(11) 84 lb. (12) $60.

July, 1887.

(1) 354,025. (2) $300. (3) $1,000. (4) $\frac{37}{39}$.
(5) 685.71\frac{3}{7}$. (6) 12 lb. (7) $250 loss. (8) 8$\frac{2}{3}$ mo.
(9) 6$\frac{1}{4}$%.

December, 1887.

(1) 205. (2) 2,750 mi. (3) $3. (4) $700.
(5) 2,560 ac. (6) First man ; $27. (7) 909$\frac{1}{11}$ oz.
(8) $720. (9) 4,928 cu. ft. (10) $1,200 ; $900.
(11) 779·01 gal.

July, 1888.

(1) Book-work. (2) 190$\frac{29}{250}$. (3) 10:52 p.m.; 246$\frac{2}{3}$ mi.
(4) $412,500. (5) $240. (6) 14,580. (7) 12 men.
(8) 24 rods by 18 rods. (9) $12,937.50.

December, 1888.

(1) $1,169.35. (2) $2.80. (3) $56.70; $25.90.
(4) $15.67 +. (5) $33\frac{1}{3}\%$. (6) 3,627 cords.
(7) $17.50. (8) $307\frac{5}{9}$ sq. yd.

July, 1889.

(1) 70. (2) $117.08 +. (3) 24 mi. (4) $4\frac{2}{3}$ ft.
(5) 13,310. (6) 60,480 ac. (7) $43.75. (8) $448.80.
(9) $1,171.41.

December, 1889

(1) 80c. (2) $9.18 nearly. (3) $54\frac{163}{528}$ mi. (4) $\$349.71\frac{9}{16}$.
(5) $320. (6) $169\frac{5}{6}$ nearly (7) 99c.
(8) $\$4,076.16\frac{3}{10}$; $\frac{431}{910}$. (9) 20 + %. (10) $2,648.78.

July, 1890.

(1) $2,213.47. (2) 6 yr. (3) $4,888\frac{8}{9}$ cub. yd.
(4) $13.20; $6.60; $2.20. (5) $67.20. (6) $18.47 +.
(7) 10 yr. (8) 60 dy. (9) 20 mi.

December, 1890.

(1) $2,495.08. (2) 100 ac. (3) $10\frac{3569}{4280}$c.
(4) $21\frac{7}{8}$ mi. from Kingston; $5\frac{5}{14}$ mi. from Kingston.
(5) $179.12. (6) $440. (7) $\$23\frac{13}{54}$. (8) $5\frac{1}{8}\%$.
(9) Merchant gains 85c. more.

June, 1891.

(1) $2,543.22. (2) $365.40. (3) 44%. (4) $\frac{7}{8}$ ac.
(5) 2,000 sheep. (6) *A*, $2,500; *B*, $3,000; *C*, $4,000.
(7) 100; 75. (8) $80. (9) 80c. due *B*.

June, 1892.

(1) $\$31.89\frac{1}{2}$. (2) $\$3.49\frac{1}{11}$; $\$3.43\frac{3}{4}$. (3) $49.60. (4) $81.69.
(5) $435. (6) $8. (7) $\cdot 10\dot{9}$. (8) $368. (9) $45; $\frac{1}{2}\%$.

TORONTO PUBLIC SCHOOLS COMBINED EXAMINATION.

Senior Fourth, 1890.

(1) \$25,600. (2) \$118.91.
(3) 156 pear; 195 peach; 234 plum; 715 apple.

Senior Fourth, 1891.

(1) (*a*) $66\frac{2}{3}\%$; 75%; (*b*) \$.$18\frac{3}{4}$; \$·15; (*c*) ·008; ·007; (*d*) $\frac{1}{800}$ of the *face* value of the stocks, bonds, or other security purchased; (*e*) \$4,000. (2) \$11. (3) \$$2,946\frac{3}{4}$; $37\frac{1}{2}\%$
(4) \$5,250. (5) \$$1,666\frac{2}{3}$. (6) 20%. (7) $7\frac{1}{3}$; $\frac{27}{110}$.
(8) 51 mi. (9) $5\frac{49}{195}$. (10) $\frac{11}{15}$; \$1,650. (11) \$15.21.
(12) 36,864 bricks. (13) \$192; \$19.20.

Senior Fourth, 1892.

(1) 85 barrels. (2) 20%. (3) $20{\cdot}\dot{2}93547\dot{0}$. (4) $7\frac{1}{2}\%$.
(5) $\frac{3}{23}$ dy. (6) \$6,800. (7) \$$4\frac{5}{7}$. (8) \$$2\frac{1}{2}$.
(9) 32 yd. (10) \$70.40. (11) \$37.50. (12) \$32.

Junior Fifth, 1890.

(1) $101\frac{127}{448}$ tons. (2) \$$5.06\frac{1}{4}$.
(3) 394·142 tons; 6·9138 pills. (4) £2,378 0*s*. $11\frac{29}{41}$*d*.

Junior Fifth, 1891.

(1) \$800. (2) \$$5\frac{25}{27}$. (3) $12\frac{1}{2}\%$. (4) $\frac{8}{9}\%$; \$8.
(5) \$780. (6) \$615.30. (7) \$144.02. (8) \$44.80.
(9) $10,840\frac{1}{9}$ nearly. (10) \$150.48. (11) $19\frac{23}{288}$ in
(12) $172\frac{6}{7}$ sq. yd. (13) 600 ac.

Junior Fifth, 1892.

(1) 3 dy. (2) \$3. (3) \$2.08. (4) \$14.60.
(5) 1,000 barrels. (6) \$900. (7) $14\frac{2}{7}\%$. (8) $\frac{31}{44}\%$.
(9) 21 mi. (10) 21·21 + in. (11) 28.
(12) $631\frac{1}{9}$ sq. ft. (13) 672 ft.

Senior Fifth, 1890.

(1) \$5.06$\frac{1}{4}$.
(2) (*a*) $19\frac{243}{599}$ mi.; (*b*) $39\frac{41}{91}$ mi.; (*c*) $46\frac{6}{19}$ mi.; (*d*) $44\frac{2}{107}$ mi., (*e*) $67\frac{31}{47}$ mi. (3) 394·142 tons; 6·9138 pills.
(4) *A*, $\pounds\cdot\dot{5}$; *B*, $\pounds\cdot 1\dot{8}\dot{5}$. (5) 10 min.
(6) \$880. (7) $21\frac{45}{77}$ min. (8) £61 13*s*. $1\frac{1}{4}$*d*.
(9) The examiner has stated the question somewhat vaguely. The circles for the daughters were no doubt intended to be the largest possible, each touching the other two and the circumference of the larger circle. Describe the circles as suggested. The straight lines joining the centres of any two of the circles will pass through the point of contact. (Euclid III., 11 and 12.) If r be the radius of a smaller circle it can be shown that the distance from the centre of a smaller circle to the centre of the larger one is $\frac{2\,r}{\sqrt{3}}$. Hence the radius of the larger circle will be $r\left(1+\frac{2}{\sqrt{3}}\right)$; and since the area of the large circle is 500 acres, we find an equation having r for the unknown quntity. The rest is merely a matter of time. The distance of daughters from one another is $2\,r = 814\cdot5$ yards; and the distance of each daughter from the mother $= \frac{2\,r}{\sqrt{3}} = 470\cdot02$ yards.

Senior Fifth, 1891.

(1) *A*, \$$187\frac{1}{2}$; *B*, \$300; *C*, \$480.
(2) $27\frac{1}{2}$ lb. tea; $24\frac{1}{2}$ lb. sugar. (3) \$$616\frac{1}{2}$. (4) \$$269\frac{103}{413}$.
(5) \$246.57. (6) $15{,}365\frac{5}{63}$. (7) \$41,465.67.
(8) $1\frac{9}{16}$% gain. (9) \$$944\frac{8}{143}$. (10) \$3,880. (11) $1\frac{1}{3}$ mo.

Senior Fifth, 1892.

(1) \$$28\frac{1}{2}$. (2) \$9,000. (3) \$324.84. (4) $109\frac{1}{16}$.
(5) \$11.33. (6) 5 lb. (7) \$7,590.
(8) 28% discount. (9) \$2,475. (10) 98·02 + in.
(11) 64. (12) 113·0916 cub. in. (13) $837\frac{31}{35}$ cub. ft.

ONTARIO EDUCATION DEPARTMENT.

Third Class or Primary.

June, 1886.

(1) \$46. (2) 249 mi. (3) 24 min. after 4.

(4) Supposing the man fairly paid with $\frac{5}{6}$ of the money, to have paid the boy fairly, he should have received $\frac{2}{6}$, in other words, the man should have received 5 units of pay for the boy's 2 units, therefore, the man was doing $\frac{5}{7}$ of the work. This he did in 15 hr.; he would, therefore, require 21 hr. without the aid of the boy.

(5) 2 gal. (6) 15; 25; 35. (7) $22\frac{3}{4}$c.

(8) $\$253.03 - (\$5.11 + \$\cdot45) = \$247.47$. (9) 490·49 gal.

June, 1887.

(1) $\frac{1605}{3311}$. (2) *A*, \$12; *B*, \$22.50; *C*, \$67.50. (3) $5\frac{141}{265}$ dy.
(4) ·007916. (5) June 11th. (6) £16,251 7*s.* $9\frac{21}{32}$*d.* It will be observed in solving, that the price is given for a ton of 2,240 lb.
(7) $12\frac{4}{13}$. (8) $1\frac{2}{23}$ parts to each 100 parts of the mixture.

(9) This question is somewhat indefinite. The examiner may mean that the \$8,000 of his own money left, like that borrowed, is worth but 4%, and in loaning at 8% there is a gain of 4% on the whole sum lent. To gain the \$2,000 lost he would require to make 4% on \$50,000; but of this sum \$8,000 is his own. Therefore, he would require to borrow \$42,000. (10) $10\sqrt{286}$ yd.

(11) $(1\cdot003)^3 - 100 = \cdot9027027\%$. (12) $14\frac{118}{385}$ min.

June, 1888.

(1) (*a*) $\frac{133}{544}$; (*b*) $\frac{69426697}{72582480}$. (2) *A*, 33 dy.; *B*, 66 dy.; *C*, 99 dy.
(3) \$67.60. (4) 1st sale, \$3,784.57; 2nd sale, \$10,303.49; cost, \$6,307.62; therefore, gain, \$7,780.44.
(5) 20 men; 32 women. (6) *A*'s \$842.30 nearly.
(7) 180 lb. tin; 585 lb. lead. (8) 65c.
(9) *A*, $\frac{16}{29}$; *B*, $\frac{9}{29}$; *C*, $\frac{4}{29}$. (10) $\$117\frac{6}{7}$, omitting the ends.
(11) 7c. (12) 4,528 sq. yd.

June, 1889.

(1) (*a*) $\frac{11}{60}$; (*b*) 10·1874. (2) 265 dy.; 10%. (3) 8%.
(4) 29 rods. (5) $2,472.94. (6) House, $812; farm, $3,045.
(7) $7.20. (8) *A*, $1,514.13; *B*, $2,708.20. (9) 770 shares.
(10) 6%. (11) 2.20\frac{2}{3}$. (12) 20 in.

June, 1890.

(1) (*a*) Book work; (*b*) 10,080; (*c*) 110,250.
(2) (*a*) Book work; (*b*) £6 16*s*. 5*d*. (3) 3$\frac{1}{2}$ sovereigns.
(4) 30,720. (5) $\frac{1}{30}$ less. (6) 818 yd. (7) 234$\frac{2}{3}$ yd.
(8) 6 in. (9) 101\frac{23}{27}$.
(10) Taking True Discount to find the cash value of the cost of the goods, we find, to gain 6$\frac{2}{3}$%, we must get $6. Now 12c. is 6 months' interest on $6 at 4%. Therefore time is 6 mo.
(11) (*a*) Book work; (*b*) Aug. 23. (12) $112.76.

June, 1891.

(1) (*a*) and (*b*) Book work; (*c*) $9\cdot\dot{9}8907\dot{9}$; (*d*) Mechanical.
(2) $90. (3) $10.50. (4) 31$\frac{11}{19}$%. (5) 102\frac{2}{5}$.
(6) $1895·712896. (7) $825·8287 + .
(8) Area 84; perpendiculars 12$\frac{12}{13}$, 12, 11$\frac{1}{5}$.
(9) Capacity 472$\frac{79}{216}$ cub. ft.; external area 337$\frac{1}{18}$ sq. ft.
(10) 10$\frac{47}{80}$ tons. (11) Cash remitted to *A*, $5,234.14.
(12) *B* pays $4. (13) Self-testing.

June, 1892.

(1) Book work. (2) (*a*) ·0097059015;
(*b*) 2^6, 3^2, 5, 7, 11^3, 13^3 17^2, 19^2, 23, 29, 31, 37.
(3) 3·1 + ft. (4) $831.23 + . (5) $17,415.
(6) Jan. 7, 1891. (7) $951.87 + . (8) $3,975.70.
(9) (*a*) 420 sq. ft.; (*b*) 11·1409273 nearly.
(10) (*a*) ·2675082327856 cub. ft.; (*b*) 840 ft.

LT 1001.54.7.G [illegible] 1892